IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

ADAPTIVE SPECTRUM AND SIGNAL ALIGNMENT, INC., Plaintiff, v. CHARTER COMMUNICATIONS, INC., Defendant.	Case No. 2:24-cv-00124-JRG-RSP JURY TRIAL DEMANDED

DECLARATION OF DR. RICHARD A. KRAMER CONCERNING CLAIM CONSTRUCTION OF U.S. PATENT NO. 11,050,654 AND U.S. PATENT NO. 11,477,108

I. INTRODUCTION

1. My name is Dr. Richard Alan Kramer. I am over the age of 18 and am competent to make this Declaration concerning claim construction ("Declaration"). I have personal knowledge or have developed knowledge based upon education, training, or experience, of the matters set forth herein. If called upon to do so, I would testify competently thereto.

2. I have been retained by counsel for Adaptive Spectrum and Signal Alignment, Inc. ("ASSIA") in the above-captioned proceeding as an independent consultant to offer opinions regarding how a person of ordinary skill in the art would understand certain claim term(s) in U.S. Patent No. 11,050,654 (the "'654 Patent") and in U.S. Patent No. 11,477,108 (the "'108 Patent") (collectively, the "Asserted Patents")[1]. For the purposes of this Declaration, I have not been asked to opine on the meaning of any other disputed terms not addressed below.

3. In forming my opinions, I understand that the claims should be interpreted as they would be understood by a person of ordinary skill in the art ("POSITA") of the patent at the time its application was filed. I understand that the claims are to be construed with reference to the patent's specification, the claims, and the prosecution history, in light of the plain meaning of the terms used in the claims, and with reference to other sources of information, such as dictionaries, textbooks, and literature or other patents in the same or related fields.

4. My opinions are based on my years of education, research, and experience, as well as my investigation and study of relevant materials, including those identified in this Declaration.

5. I may rely upon these materials, my knowledge and experience, and/or additional materials in forming any necessary opinions. Further, I may also consider additional documents

[1] I may also refer to the '654 Patent and the '108 Patent as the "Patents-In-Suit" or "Patents at Issue." I further note that other patents are asserted in this case, but this Declaration is limited to the '654 Patent and the '108 Patent.

and information to rebut arguments raised by the Defendants. I reserve any right that I may have to supplement this Declaration if further information becomes available or if I am asked to consider additional information. Furthermore, I reserve any right that I may have to consider and comment on any additional expert statements or testimony of Defendant's expert(s) in this matter.

6. My analysis of the materials produced in this investigation is ongoing, and I will continue to review any new material as it is provided. This Declaration represents only those opinions I have formed to date. I reserve the right to revise, supplement, and/or amend my opinions stated herein based on new information and on my continuing analysis of the materials already provided.

7. If requested, I am prepared to explain at a technology tutorial or claim construction hearing the technology disclosed in the Patents at Issue, including the state of the art around the filing dates of this patent. This may include, among other things, background information on network communication systems, broadband communications systems/cable systems (*e.g.,* cable TV systems, HFC (Hybrid Fiber Coax) cable systems, etc.), telecommunication systems, satellite communication systems, and RF (Radio Frequency)[2] systems, further including systems architectures, components, and applications thereof for these types of systems. Any explanations that I may provide with respect to a technology tutorial or claim construction hearing may also include the use of visual aids or other demonstrations. I am also prepared to rebut, as necessary, matters raised by the expert(s) of Defendant Charter Communications, Inc. ("Charter")—whether in declarations, reports, depositions, or hearings—and to address related matters raised in the course of claim construction.

[2] "RF," which means "Radio Frequency," is a term and technology that not only applies to wireless systems, but also applies to terrestrial systems such as, for example, cable systems (including cable and/or HFC systems) and related devices.

II. QUALIFICATIONS AND PROFESSIONAL EXPERIENCE

8. In this section, I provide a summary of my educational background, employment background, and other relevant qualifications. A more detailed statement of my professional qualifications, including education, publications, honors and awards, professional activities, consulting engagements, and other relevant experience, is included in my curriculum vitae -- attached as Appendix A to this Declaration and incorporated by reference herein.

9. I have 40-plus years of in-depth industry experience developing and deploying successful networking communications systems including experience with transmission analysis and optimization techniques, as well as experience with telecommunications, cable, and wireless networks. My experience with these types of systems further includes systems architectures, software, components, and applications thereof — to name a few.

10. From 2007 to the present, I currently serve as President of SIS Development, Inc. / Security Industry Services, Inc., an engineering and technical services company specializing in the technical areas of, for example, communication systems (including cable TV/broadband systems), video systems, wireless networking, Internet technologies, and client-server systems. Exemplary technical services that I have provided include assisting companies in the cable TV and communications industry.

11. From 2003 to 2007, I served as the Vice President-Engineering and General Manager-Technology at GE-Security, a division of General Electric (GE), which is now owned by United Technologies Corporation (UTC). At GE, I was the lead engineer for the worldwide "Video Systems Group" which developed video products, multimedia network communications systems and products, and HFC-based systems and products. At GE, I was also the lead engineer for residential and commercial security systems engineering and development for North America.

12. From 1998 to early 2003, I was the top technology leader at a number of high-tech start-up companies. Those high-tech start-up companies included Miraxis Corporation (a division of EMS Technologies, Inc., acquired by Honeywell, Inc.). At Miraxis, I was the Vice President of Product Development from late 2001 to early 2003, developing IP network and digital video solutions in the satellite TV industry (*e.g.,* a DTH (Direct to Home) / DBS (Direct Broadcast Satellite) solution). As the Vice President of Product Development, I was responsible for all aspects of the system architecture and components to provide both multimedia content and two-way modem communications.

13. In 2000, I joined Ivex Corporation ("Ivex"), serving as the Vice President of Engineering and leading all technology development. At Ivex, I led the development of network video surveillance solutions, including a product called the VSA (Video Streaming Appliance) and an Internet/network system/software solution called ViewOps. Our solutions allowed retail chains like Ace Hardware, Finish Line, and Eddie Bauer to remotely view their sites and facilities using servers. Further, the user could log into the ViewOps system to obtain pre-recorded events triggered by various sensor inputs.

14. In 1998, I joined Home Wireless Networks, Inc., where I was promoted to Vice President of Engineering. At Home Wireless Networks, I led all engineering in the development of leading-edge wireless products, including 900 MHz RF circuits, antennas, and transceivers. Home Wireless Networks' products—which included the first integrated voice and low-cost IEEE 802.11 WiFi access point—were launched under the British Telecom and Telenor brands in Europe and the BellSouth and MCI brands in the United States. At the time we used well-known IC (Integrated Circuit) design methods and SoC (System on a Chip) design methods. For example, as Vice President of Engineering at Home Wireless Networks, I was responsible for the

development of an SoC (System on a Chip) that integrated an ARM processor. The ARM processor core was provided to us in the form of a hardware library (*e.g.,* in the form of HDL (Hardware Description Language)) that we then integrated into our SoC as a whole. We then had an outside semiconductor foundry manufacture our SoC. Moreover, our system solutions provided network interfaces back to a central office.

15. From 1995 to 1998, I was the engineering/technology leader for multimedia cable TV set-top boxes in North America for Scientific-Atlanta, Inc. (before being acquired by Cisco Systems, Inc.) within the Advanced Video Systems (AVS) Division. My group developed and successfully launched Scientific-Atlanta's first internally designed cable TV set-top box (also called an HCT which means Home Communication Terminal). The development of the cable TV set-top boxes that I led engineering for included responsibility for RF, analog, and digital design for the finished products.

16. At Scientific-Atlanta, in addition to my leadership in the development of cable TV products, I was also responsible for testing the products for our entire division as a whole. Subsequently, I directly managed the construction and operation of our own complete cable TV Head End (HE) system. When we designed products, we evaluated the performance of our products within the entire cable TV system including within the cable TV HE that we operated. Such evaluations of performance included the measurement and monitoring of a whole host of system impairments related to cable TV system two-way communications including those measurements related to SNR (Signal to Noise Ratio) and other modulation impairments.

17. At Scientific-Atlanta, I was later promoted and served as the top technology leader on the Strategic Planning Team for the AVS Division, working on the next-generation advanced video products, including the overall system design, software, and HCTs. In this role, each of the

functional technology areas, including firmware, hardware, system software, and cable system communication headend equipment, reported to me in a dotted-line matrix/cross-functional organizational structure for the development of our next generation of products and solutions.

18. As part of my responsibilities at Scientific-Atlanta, I stayed current with industry standards that we implemented into our systems such as, for example, the DOCSIS (Data Over Cable Service Interface Specification) standard, the MPEG (Motion Pictures Expert Group) standard, and various Internet/networking standards such as the SNMP (Simple Network Management Protocol) standard. Moreover, the products and solutions that I led the development of at Scientific-Atlanta included a plethora of technologies, including the development of cable TV communication circuits and systems and RF circuit design.

19. From 1987 to 1995, I held a number of technology positions at Schlumberger Industries, Electricity Management North America. From 1987 until 1989, I was an Electronic Design Engineer at Schlumberger. As an Electronic Design Engineer, I designed circuitry and firmware for solid-state electronic electric meters, including the design of a PLC (Programmable Logic Controller), which was an IC that did not include a processor. I also designed an Application Specific Integrated Circuit (ASIC). The use of ASICs and PLCs were well-known technologies at the time. I worked on many aspects of design for our core metering products including the design of AMR (Automatic Meter Reading) electronics. The electricity meters that I designed further employed a wide array of sensors to measure electric power consumption, low battery conditions, tamper detection, and the like.

20. In 1989, I was promoted to Senior Electronic Design Engineer at Schlumberger. In 1990, I was promoted to Hardware Manager of the Recorders and Translation Systems where I led

the development of data interfaces between electricity meters and a utility's remote central office. In 1994, I was promoted to Engineering Manager, Residential and Commercial Metering.

21. As Engineering Manager, Residential and Commercial Metering for Schlumberger, I oversaw product development of residential and commercial solid-state electronic electricity meters for North America. For example, I was responsible for the engineering design of the "MACS" (Metering And Communications System) that was used to remotely read and control electricity meters installed within multi-tenant buildings using the existing power lines. We called this PLC (Power Line Carrier) network communication technology. In fact, PLC was one of the first communication methods used for "Smart Homes" which at that time was in its early infancy. PLC was seen as a means to communicate between various appliances and the utility meter within a home. As part of my R&D (Research and Development) duties, I extensively researched Smart Home technology and PLC technology and as a result, I attended a Parks Associates Smart Home workshop in or around 1994.

22. In 1984, I began work as an Electronic Design Engineer in the Nuclear Power Division at Babcock & Wilcox. I was later promoted to Senior Electronics Design Engineer.

23. In the Special Products and Integrated Field Services team at Babcock & Wilcox, my work involved designing and developing both: (a) monitoring systems to monitor the operation of the nuclear power plant equipment, and (b) inspection/robotic repair systems to inspect and repair nuclear power plant components inside the nuclear containment buildings. My work required me to implement a wide variety of sensor technologies into the control room monitoring and robotic systems that I designed.

24. Related to monitoring systems at Babcock & Wilcox, as just one example, I helped redesign portions of a Safety Parameter Display System (SPDS). The SPDS was a system used in

the control room of nuclear power plants to allow the operators to monitor the plethora of equipment and related sensors within a nuclear power plant. For example, such sensors determined temperature, the state of valves and other equipment (closed / not closed), water levels, pressure, and radiation levels, to name a few.

25. Related to inspection/robotic repair systems at Babcock & Wilcox, I was one of the key designers of the electronics, software, and firmware (for measurement, control, and communications) for a robot called "ROGER" (Remotely Operated Generator Exam and Repair). My work in designing ROGER required me to work with a plethora of sensor technologies including cameras (to monitor activities and position of the robot), temperature sensors (for monitoring equipment health), and motion sensors (that enabled us to detect and control ROGER's position and movement within a nuclear power plant steam generator). My developments further implemented cable TV systems to enable visual inspection within the containment building and in other high-radiation areas. ROGER was also outfitted with various exchangeable "tools" that allowed us to perform different types of inspections and repairs on nuclear steam generators which utilized a wide variety of sensor technologies to monitor remote equipment. The sensor states and parameters, including temperature and switch positions, were sent back via a dedicated serial communications network channel called "SDLC" (Synchronous Data Link Control) to remote systems operated by personnel far away from the highly radioactive steam generator.

26. In 1984, I received a Bachelor of Science in Electrical Engineering, magna cum laude, from the University of Toledo.

27. In 2017, I received a Master of Science in Electrical and Computer Engineering from Oregon State University, where I graduated with a 4.0 GPA (Grade Point Average). My thesis, entitled "Optimization of Interactive Live Free Viewpoint Multiview Video Streaming

Bandwidth," was based on my own research in streaming multiview video over the Internet using peer-to-peer networks and wireless broadcast transmissions.

28. In 2022, I received a Ph.D. in Electrical and Computer Engineering from Oregon State University based on my academic research that I started in 2015. I graduated with a 4.0 GPA (Grade Point Average). My dissertation, entitled "Machine Learning Bandwidth Optimization of Interactive Live Free-Viewpoint Multiview Video for Sporting Events," was based on my own research combined with my applied industry knowledge in the fields of artificial intelligence, machine learning, classifiers, video/video detection/video analytics/video content prediction, and communication systems (including cable/HFC and satellite systems). The heart of my dissertation was to intelligently predict and then optimize network communications of multimedia data over two-way DVB (Direct Video Broadcast) terrestrial systems (which include two-way DVB cable TV systems and DVB IPTV (Internet Protocol TV) systems)), two-way DVB satellite systems, and P2P (Peer-to-Peer) systems.

29. I am a member of the Institute of Electrical and Electronics Engineers (IEEE).

30. I am a lifetime member of the honor society of Phi Kappa Phi.

31. In 2003, I attended Emory University's Goizueta Business School and took numerous MBA (Master of Business Administration) courses. At the time, Business Week and The Financial Times ranked Emory's business school program in the top 10 globally.

32. I have received two U.S. patents: (a) U.S. Patent No. 5,701,253, entitled "Isolated Current Shunt Transducer," which describes an, at the time, new transducer sensor design for measuring electricity, and (b) U.S. Patent No. and 5,422,939, entitled "Parallel Off-Hook Detection for Both Line-Available and Phone Pick-Up Detection," which describes an at-the-time new device for sensing the state of telephone lines.

III. COMPENSATION

33. I am being compensated for my services in this matter at my standard consulting rate of $825 per hour. I am also being reimbursed for expenses that I incur during the course of this work. My compensation is not contingent upon the results of my study, the substance of my opinions, or the outcome of any proceeding involving the Asserted Patents/Claims. I have no financial interest in the outcome of this matter.

IV. MATERIALS CONSIDERED

34. In preparing this Declaration, I reviewed and considered the following materials:

1) the Patents at Issue and their file histories, as well as the patents and file histories for the applications identified as Related U.S. Applications on the face of the Patents at Issue;

2) materials from IPR2025-00087, including Defendants' petition and the supporting declaration of Dr. Houh;

3) materials from IPR2025-00088, including Defendants' petition and the supporting declaration of Dr. Houh;

4) the parties' proposed claim constructions;

5) the extrinsic evidence cited herein; and

6) any other material referenced in the body of my Declaration.

35. I may use these documents and information, or other information obtained during the course of this or related proceedings, as well as representative charts, graphs, schematics and diagrams, animations, and models based on those documents and information, to support and to explain my testimony. I am informed that discovery in this action is ongoing, and I reserve the right to modify or supplement my opinions, this Declaration, and/or to submit additional declarations to address any information obtained, or positions taken, as discovery continues.

36. My opinions are based in part on a review and analysis of the above-mentioned documents and materials. The materials relied upon within this Declaration are of the type that an

expert in my field would have reasonably relied upon in forming opinions. I have also drawn on my education, experience, and knowledge of basic engineering principles for the analysis and optimization of network communication systems including, for example, broadband communications systems/cable systems (*e.g.,* cable TV systems, HFC cable systems, etc.), telecommunication systems, satellite communication systems, and RF systems, further including systems architectures, components, and applications thereof for these types of systems, that were already in use prior to, and within the timeframe of the earliest priority dates for the claimed subject matter in the Patents at Issue.

V. LEGAL STANDARDS

37. I am not an attorney or a patent attorney, and I offer no opinions on the law. I have, however, been informed by counsel regarding various legal standards that may apply to this case, and I have applied those standards where necessary in arriving at my conclusions.

38. I understand that patent claims are construed from the viewpoint of a person of ordinary skill in the art ("POSITA") at the time of the invention. I understand that this hypothetical POSITA is considered to have the normal skills and knowledge of a person in the applicable technical field. The factors that may be considered in determining the level of ordinary skill include: i) the education level of the inventor; ii) the types of problems encountered in the art; iii) the prior art solutions to those problems; iv) the rapidity with which innovations are made; v) the sophistication of the technology; and vi) the education level of active workers in the field.

39. I understand that the most important evidence to consider in construing the claims is the "intrinsic" evidence, which I understand includes the claim language, the patent specification, and the prosecution history, including *inter partes* review ("IPR") and other post-grant proceedings with the United States Patent and Trademark Office's ("USPTO") Patent Trial and Appeal Board ("PTAB").

40. I further understand that a POSITA must read the claim terms in the context of the claim itself, as well as in the context of the entire patent specification. I understand that in the specification and/or prosecution history, the patentee may specifically define a claim term in a way that differs from the plain and ordinary meaning of the term. I understand that the prosecution history of the patent is a record of the proceedings before the USPTO and may contain explicit representations or definitions made during prosecution that affect the scope of the patent claims. I understand that an Applicant may, during the course of prosecuting the patent application, limit the scope of the claims to overcome prior art or to overcome an Examiner's rejection, by clearly and unambiguously arguing to overcome or distinguish a prior art reference or by clearly and unambiguously disclaiming claim coverage.

41. In interpreting the meaning of the claim language, I understand that a POSITA may also consider "extrinsic" evidence, which consists of all evidence external to the patent and prosecution history, including expert and inventor testimony, positions taken by the patent owner in other litigations, dictionaries, and learned treatises. I understand that extrinsic evidence may not be relied on if it contradicts or varies the meaning of the claim language provided by the intrinsic evidence, particularly if the Applicant has explicitly defined a term in the extrinsic record.

42. I also understand that a patent claim may not be interpreted one way to avoid invalidity and another way to find infringement. In other words, a claim must be read the same way for validity as for infringement.

43. I understand that Section 112 of the Patent Laws requires that a patent claim particularly point out and distinctly claim the subject matter that the Applicant regards as his or her invention. I understand that a patent claim is invalid for indefiniteness if it fails to inform, with reasonable certainty, a person of ordinary skill in the art about the scope and bounds of the

invention claimed. I understand a claim is indefinite if its scope is not clear enough that a POSITA could have determined with reasonable certainty whether a particular embodiment infringes the claim. I also understand that when considering whether a claim is indefinite, a POSITA may consider both the intrinsic and extrinsic evidence.

44. I understand that a term may be found to be indefinite when the claim language is facially subjective or ambiguous, and the meaning of a term and/or scope of the claims is not "reasonably certain" to one skilled in the art.

45. I understand that failure to provide an explicit antecedent basis for a term does not always render a claim indefinite. If the scope of a claim would be reasonably ascertainable by those skilled in the art, then the claim is not indefinite.

46. I understand there are instances where inherent components of elements recited have an antecedent basis in the recitation of the components themselves. For example, the limitation "the outer surface of said sphere" would not require an antecedent recitation that the sphere has an outer surface.

VI. LEVEL OF ORDINARY SKILL IN THE ART

47. In rendering the opinions set forth in this Declaration, I was asked to consider the patent claims and the prior art through the eyes of a person of ordinary skill in the art ("POSITA"). The "art" is the field of technology to which a patent is related. In my Declaration, I use the term POSITA to refer to the same hypothetical person of ordinary skill in the art. I considered factors such as the educational level and years of experience of those working in the pertinent art, patents, and publications of other persons or companies, the sophistication of the technology, the types of problems encountered in the art, the prior art solutions to those problems, and the speed at which

innovations are made. I understand that a POSITA is not a specific real individual but rather a hypothetical individual having the qualities reflected by the factors discussed above.

48. The Patents at Issue relate to the analysis and optimization of network communication systems, including, for example, broadband communications systems/cable systems (*e.g.,* cable TV systems, HFC (Hybrid Fiber Coax) cable systems, etc.), telecommunication systems, satellite communication systems, and RF (Radio Frequency) systems, further including systems architectures, components, and applications thereof for these types of systems. For example, each of the Patents at Issue entails network analysis and performance optimization of networks as I further discuss below. *See e.g.*, ¶¶ 52-65 and ¶¶ 78-86 (*infra*) where I provide further details about the '654 Patent and '108 Patent in this regard.

49. These types of technologies were typically designed by Electrical, Firmware, and Software Engineers who had experience working with these types of communication systems. I have performed such development myself and have further worked with and directly managed these types of Engineers in the industry. I am, therefore, very familiar with the common skill sets required for this type of work.

50. Taking these factors into consideration and based on my experience in the industry at the time of the earliest priority dates of the Patents at Issue, it is my opinion that a POSITA would have at least a bachelor's degree in electrical engineering, or a related field, with at least two years of experience developing electronic communications systems. Additional education may serve as a substitute for a lack of experience and vice versa.

51. As of at least approximately 2011, I was at least as qualified as the POSITA identified above. Thus, I understand the perspective of a POSITA as of at least as early as 2011, the earliest priority date of any of the Patents at Issue.

VII. THE '654 PATENT

A. Overview of the '654 Patent

52. The '654 Patent is titled "Method and System for Using a Downloadable Agent for a Communication System, Device, or Link" and was issued on June 29, 2021 (*see* '654 Patent at (54), (45)). Glauser Decl.[3], Exhibit D. The '654 Patent was filed on September 25, 2012, under U.S. Patent Application No. 14/414,436, and PCT/US2012/057152 (*id.* at (21), (22), (86)). The '654 Patent claims priority under U.S. Provisional Application No. 61/671,672, filed July 13, 2012 (*id.* at 1:9-24).

53. Independent Claim 1 of the '654 Patent is reproduced below:

> **1.** A method performed by a downloadable agent, the method comprising:
>
> collecting WAN performance information, wherein the downloadable agent is executable on a computing device coupled to a LAN of a broadband subscriber, wherein the LAN is coupled by another device to a WAN;
>
> transmitting the WAN performance information to a machine, wherein the machine is operable to:
>
> store the WAN performance information in a database associated with the machine,
>
> analyze the WAN performance information to generate an analysis result, the analysis result comprises at least throughput; and
>
> report the analysis result to at least one of the broadband subscriber and the broadband subscriber's service provider; and
>
> sending an on-demand change request associated with at least one of throughput, or latency.

'654 Patent, Claim 1.

[3] Lettered Exhibits referenced herein are attached to the Declaration of Nicole Glauser ("Glauser Decl.") in Support of Plaintiff's Opening Claim Construction Brief, filed concurrently herewith.

54. The ’654 Patent discloses an invention that is directed at overcoming the deficiencies of prior broadband network systems that lacked the centralization of “Wide Area Network (WAN) and/or Local Area Network (LAN) performance information.” *See* ’654 Patent at 1:28-41, reproduced below.

> **In current practice, Wide Area Network (WAN) and/or Local Area Network (LAN) performance information is not centrally analyzed by a communication device coupled to such networks to account for information such as topological information, geographical information, user's network usage pattern, quality of network connection, time, throughput, etc.** Accordingly, communication devices coupled to such networks may operate with lower performance than otherwise possible because the communication devices have no means for knowing performance data that can be used to intelligently assess and manage performance of the communication device and/or network connection. An example of a communication device is a smart phone, computer, a router, etc.

’654 Patent, 1:28-41, emphasis added.

55. To allow for the centralization of, *e.g.,* WAN performance information, the ’654 Patent discloses a “downloadable agent for a communication system, device or link” (’654 Patent at title) that collects WAN performance information that is then reported to a machine such as a centralized server (*id.* at Abstract). The ’654 Patent Abstract is reproduced below.

> **Described is a method performed by a downloadable agent, the method comprising: collecting WAN performance information, wherein the downloadable agent is executable on a computing device coupled to a LAN of a broadband subscriber, wherein the LAN is coupled by another device to a WAN; and transmitting the WAN performance information to a machine**; wherein the machine is operable to: store and analyze the performance information to generate an analysis result; and report the analysis result to at least one of the broadband subscriber and its service provider. Described is a corresponding system which comprises a database; and a server coupled to the database, the server operable to: receive WAN performance information from a downloadable agent; store the information in the database, analyze the information to generate an analysis result; and report the analysis result to at least one of the broadband subscriber and the broadband subscriber's service provider.

’654 Patent Abstract, emphasis added.

56. The '654 Patent describes the aforementioned "downloadable agent" (also referred to as "DA") as software that "may be executable on a variety of different computer platforms and operating systems" ('654 Patent at 2:67-3:2; *see also e.g, id.* at 5:23-25) within a wide range of devices, also called "computing devices" (*id.* at *e.g.,* Abstract, "the downloadable agent is executable on a computing device," reproduced above). Computing devices that may comprise the downloadable agent include, for example, "a smart phone, computer, a router," an "access point (AP)," "a wireless LAN device," "an access gateway," "an Ethernet gateway," "Customer Premise Equipment (CPE)," "a cable CPE modem," a "network bridge," a "network switch," "etc." *Id.* at 1:39-41, 6:28-50. *See also* e.g., *id.* at 11:11-34, 12:29-53, 17:53-18:11, 19:56-20:12, FIG. 1.

> **An example of a communication device is a smart phone, computer, a router, etc.**

'654 Patent at 1:39-41, emphasis added.

> In one embodiment, the computing device is one of: computer, personal computer, laptop/desktop, smart phone, tablet computing device; an access point (AP); a base station; a wireless smart phone device; a wireless LAN device; an access gateway; a router, a performance enhancement device; a Digital Subscriber Line (DSL) Customer Premises Equipment (CPE) modem; a cable CPE modem; an in-home powerline device; a Home Phoneline Network Alliance (HPNA) based device; an in-home coax distribution device; a G.hn (Global Home Networking Standard) compatible device; an in-home metering communication device; an in-home appliance communicatively interfaced with the LAN; a wireless femtocell base station; a wireless Wi-Fi compatible base station; a wireless mobile device repeater; a wireless mobile device base station; nodes within an ad-hoc/mesh network; a set-top box (STB)/set-top unit (STU) customer electronics device; an Internet Protocol (IP) enabled television; an IP enabled media player; an IP enabled gaming console; an Ethernet gateway; a computing device connected to the LAN; an Ethernet connected computer peripheral device; an Ethernet connected router; an Ethernet connected wireless bridge; an Ethernet connected network bridge; and an Ethernet connected network switch.

'654 Patent at 6:28-50.

57. The '654 Patent goes on to explain that the "downloading" of the downloadable agent may occur via "any platform e.g., a disk memory, memory stick, web browser, web server,

etc." '654 Patent at 5:15-17. Moreover, the '654 Patent explains that the downloadable agent may be, for example, "downloaded on a user's browser" (*id*. at 2:54-58), "download[ed]" via an "install" (*id.* at 3:40-45), downloaded via "automatic updates to keep the application up to date with the latest features. In one embodiment, the downloadable agent is dynamically downloaded to the computing device" (*id.* at 5:34-38), etc. *See also id.* at *e.g.,* 8:33-42. I have reproduced exemplary disclosures ('654 Patent at 3:40-47 and 5:17-17) below.

> The embodiments herein allow a user of a communication device **to install (download) an agent on their communication device, for example, personal computer, tablet computer, laptop, network gateway, smart phone, smart device, computer, DSL (Digital Subscriber Line) access equipment, router, etc)** so that the communication device is able to collect performance related information for analysis by another machine (e.g., a server on a cloud) and …

'654 Patent at 3:40-47, emphasis added.

> **In one embodiment, the DA 102 may be downloaded from any platform** e.g., a disk, memory stick, web browser, web server, etc.

'654 Patent at 5:15-17, emphasis added.

58. Once installed, as previously mentioned and further explained herein, the "downloadable agent may be executable on a variety of different computer platforms and operating systems" ('654 Patent at 2:67-3:2), and can further be executed, for example, "remotely"(*id.* at 5:15-22), or even "virtual[ly]" (*id.* at 5:23-30). Additionally, the '654 Patent states that the downloadable agent may execute as part of a web "browser" (*e.g*, "[i]n one embodiment, the DA 102 associated with a communication device executes on an Internet browser (e.g., Safari®, Netscape®, FireFox®, Internet Explorer®, etc)." *id.* at 5:15-22)." I have reproduced exemplary disclosures, *id.* at 5:15-22 and 5:23-30, below.

> **In one embodiment, the DA 102 associated with a communication device executes on an Internet browser** (e.g., Safari®, Netscape®, FireFox®, Internet Explorer®, etc). **In one embodiment, the DA 102 associated with the communication device is accessible remotely via the Internet.**

'654 Patent at 5:15-22, emphasis added.

> **In one embodiment, the DA 102 is operable to execute on multiple computing platforms with different operating systems**. For example, the DA 102 may operate on operating systems including Android, Berkley Software Distribution (BSD), iOS, GNU/Linux, Apple Mac OS X, Microsoft Windows, Windows Phone, and IBM z/OS. **In one embodiment, the DA 102 is operable to execute in a virtual machine (VM).**

'654 Patent at 5:23-30, emphasis added.

59. Moreover, the '654 Patent discloses that the downloadable agent may be distributed such that the "downloadable agent 102 is executable on multiple computing machines (e.g., PC, smart phone, tablet, CPE, etc)" ('654 Patent at 10:63-65) such as, for example, a "first [] and "second" downloadable "agent [that] are executable on multiple computing machines" (*id.* at 12:9-11; *see also id.* at FIG. 2). I have reproduced each of these citations from the '654 Patent specification below.

> In one embodiment, the **downloadable agent 102 is executable on multiple computing machines** (e.g., PC, smart phone, tablet, CPE, etc).

'654 Patent at 10:63-65, emphasis added.

> **In one embodiment, the first (e.g., DA 1 of FIG. 2) and second (e.g., DA 2 of FIG. 2) agents are executable on multiple computing machines**.

'654 Patent at 12:9-11, emphasis added.

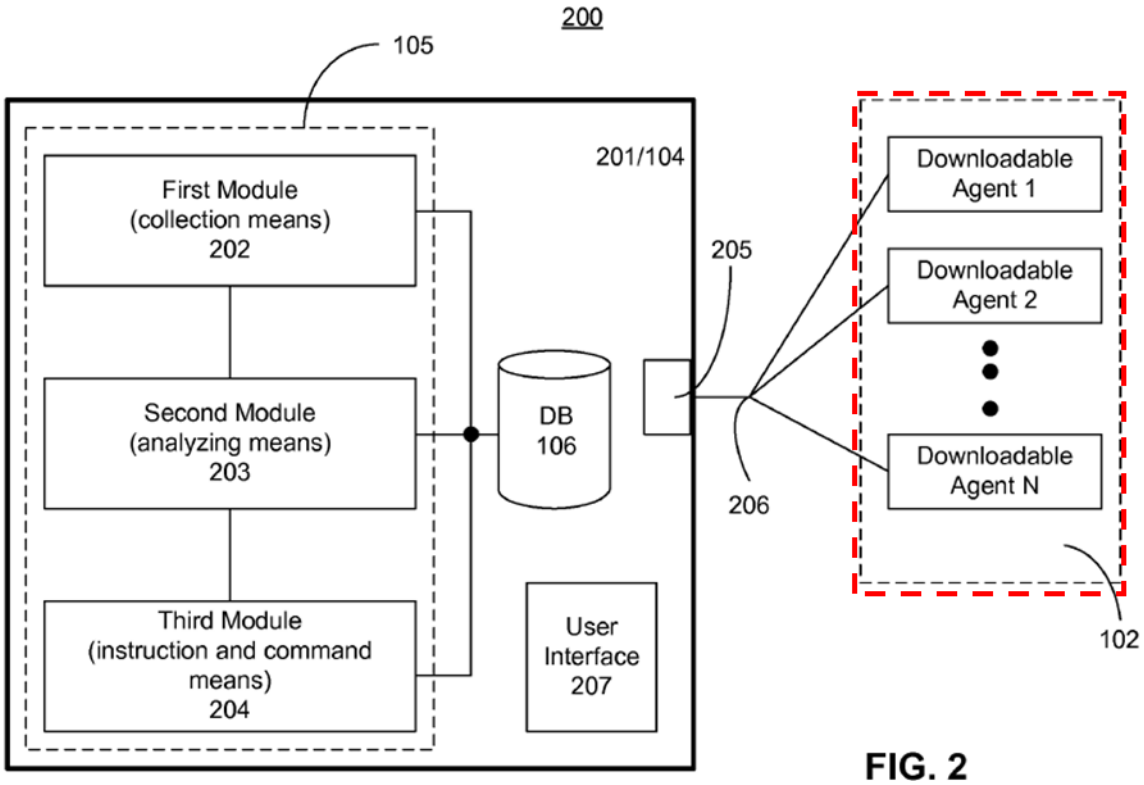


FIG. 2

'654 Patent at FIG. 2, annotated showing Downloadable Agent 1, 2 … N as described in the '654 Patent specification at *e.g.,* 12:9-11 (reproduced above).

60. The '654 Patent specification also explains that the downloadable agent(s) performs, among other things, the collection of WAN performance information[4] that is then transmitted over *e.g.,* the Internet "109," to cloud system "104." *See id.* at FIG. 1, 2:30-36, 3:13-18. To further show this, I have reproduced FIG. 1 of the '654 Patent below.

[4] Including information, for example, such as "throughput [], latency, jitter, connectivity, error rates, power consumption, transmit power, etc." '654 Patent at 3:25-27. *See also, e.g., id.* at 5:65-6:8, 6:61-7:2, 17:43-52.

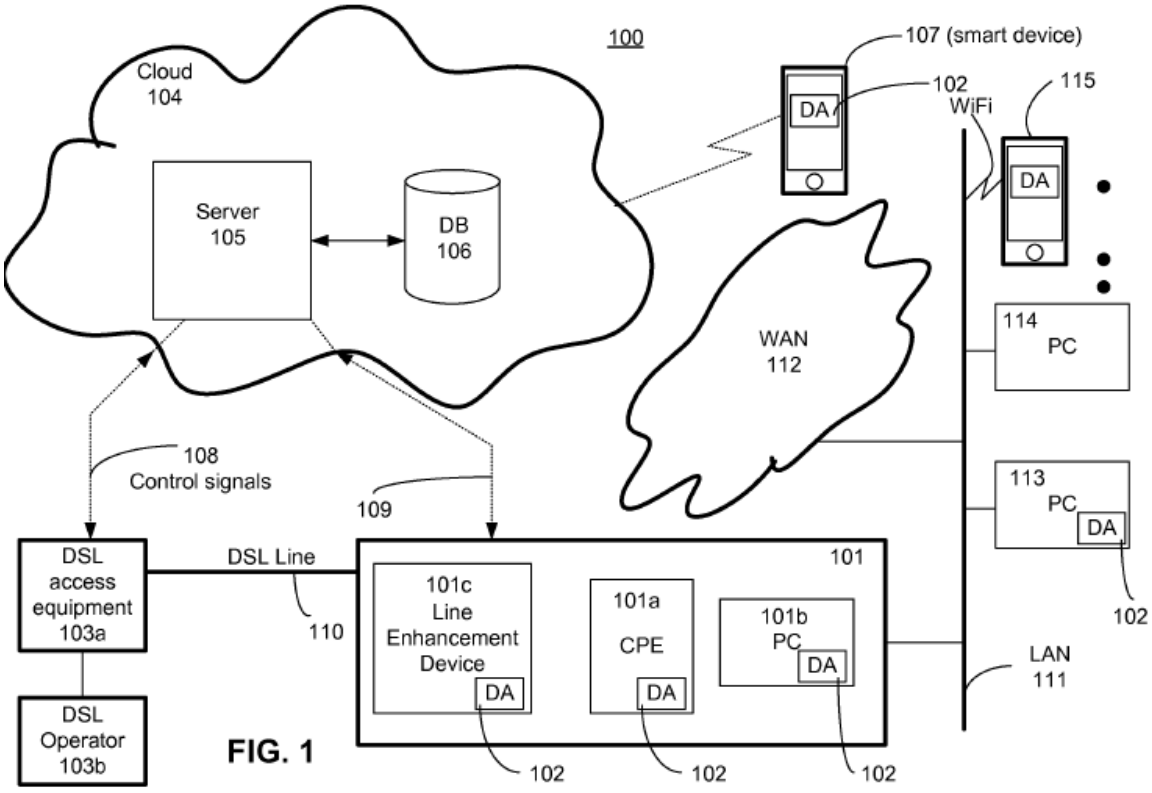


FIG. 1

'654 Patent FIG. 1 showing multiple "DA" (downloadable agent[s]) 102.

61. In addition to the communication between the downloadable agents and the cloud server,[5] the disclosed system may comprise another/other device[s] that couple the LAN to a WAN, *e.g.,* PCs, smart devices, modems, routers, etc. *See id.* at, *e.g.,* 5:50-58 (*e.g.,* "modem," "gateway"), 6:55-58 (*e.g.,* "PC"), 9:62-10:4 (*e.g.,* "PC"), 17:22 ("In one embodiment, the other device is a router"), FIG. 1. *See also id. at* Abstract. The '654 Patent states that the "coupl[ing]" (*e.g.,* of the LAN to the WAN with respect to another/other device[s]) may or may not be a literal physical connection.[6] *Id.* at 4:13-20. Moreover, the '654 Patent explains that the various devices,

[5] For example, via the Internet connection 109 in FIG. 1 of the '654 Patent. *See also id.* at FIG. 2 reference 206.

[6] Specifically, the '654 Patent states "[i]n the following description and claims, the term 'coupled' and its derivatives may be used. The term 'coupled' herein refers to two or more elements which are in direct contact (physically, electrically, magnetically, electromagnetically, optically, etc.). The term 'coupled' herein *may also refer to two or more elements that are not in*

including those comprising the downloadable agent, and the other devices that couple the LAN to the WAN, may be integrated into a single overall device. *See id.* at *e.g.,* 5:55-58 (giving the example of a "DSL modem and home gateway integrated into a single enclosure"). Additionally, the '654 Patent gives examples of how the execution of the downloadable agent may run a "diagnostic test" wherein the device executing the "downloadable agent 102 may collect data and produce analysis for the LAN and WAN performance of some other device on the LAN." *Id.* at 14:12-59. *See also id.* at 14:60-15:32, FIG. 5A, and FIG 5B. The '654 Patent specification at 14:12-59 and 14:60-15:32 are reproduced below.

> FIG. 5A is flowchart 500 of a method for **performing a diagnostic test**, according to one embodiment of the disclosure.
>
> …
>
> **At block 504, the system (machine on which the agent is running)** seeks permission from the user/customer to run the downloadable agent 102 on the machine.
>
> …
>
> **For example, at block 505 [sic. 515], the downloadable agent 102 may collect data and produce analysis for the LAN and WAN performance of some other device on the LAN, rather than collecting data and producing analyses for the device on which the DA 102 executes**.

'654 Patent at 14:12-59, annotated and emphasis added.

> FIG. 5B is flowchart 510 of a method for **running (i.e., executing) functions, according to another embodiment of the disclosure**.
>
> …
>
> **At block 514, the system (machine on which the agent is running)** seeks permission from the user/customer to run the downloadable agent 102 on the machine
>
> …
>
> **For example, at block 505, the downloadable agent 102 may collect data and produce analysis for the LAN and WAN performance of some other device on**

direct contact with each other, but still cooperate or interact with each other." '654 Patent at 4:13-20, emphasis added.

the LAN, rather than collecting data and producing analyses for the device on which the DA 102 executes.

'654 Patent at 14:60-15:32, emphasis added.

62. Turning to the cloud computing aspects of the '654 Patent, as depicted in FIG. 1 (previously shown) and FIG. 2 (reproduced below), the cloud (104) receives, for example, WAN performance information from the downloadable agent(s). *See id.* at *e.g.,* FIG. 2, 9:36-40. *See also id.* at *e.g.,* Abstract, 5:50-55, 11:61-62, FIG. 1, FIG. 3, FIG. 4B, etc. As shown in FIG. 1 and FIG. 2 by way of example, the cloud comprises a machine such as a machine/server (105) and a DB (Database, 106). *See id.* at *e.g.,* Abstract, 3:13-18, 4:45-47, 5:12-15, 10:5-17, FIG. 1, FIG. 2.

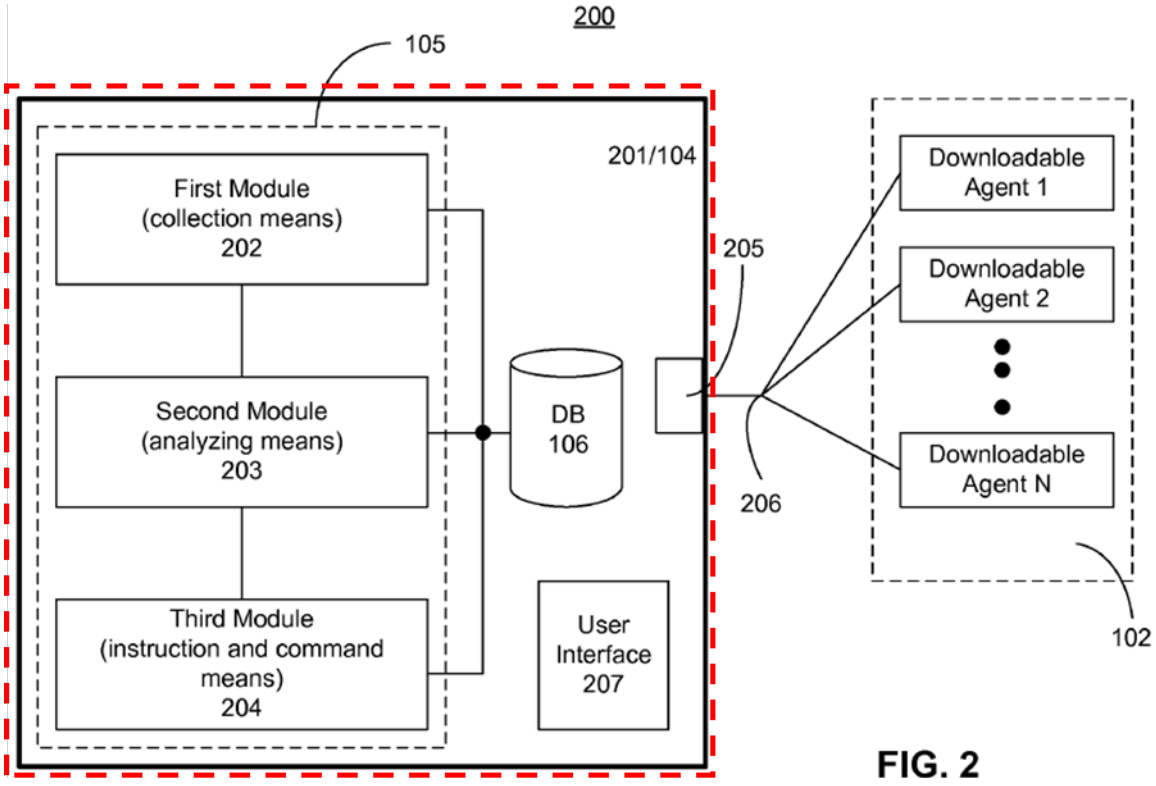
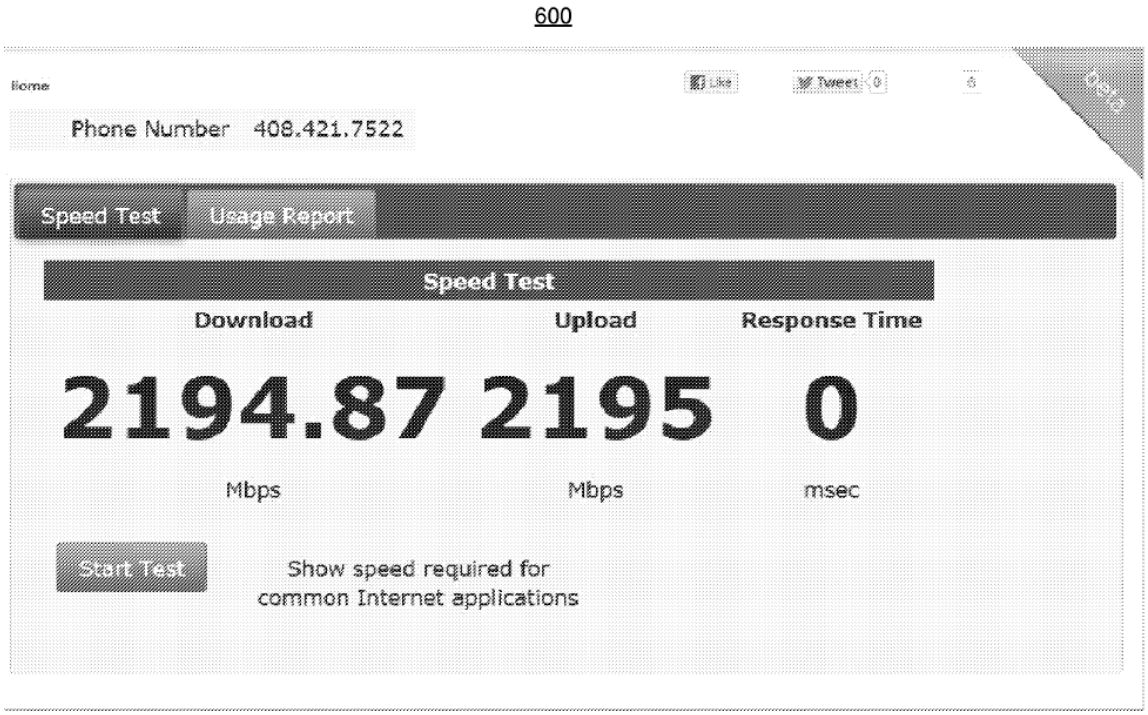


FIG. 2

'654 Patent at FIG. 2, annotated showing "device 201 (e.g., cloud 104)" elements (*id.* at 9:15-21).

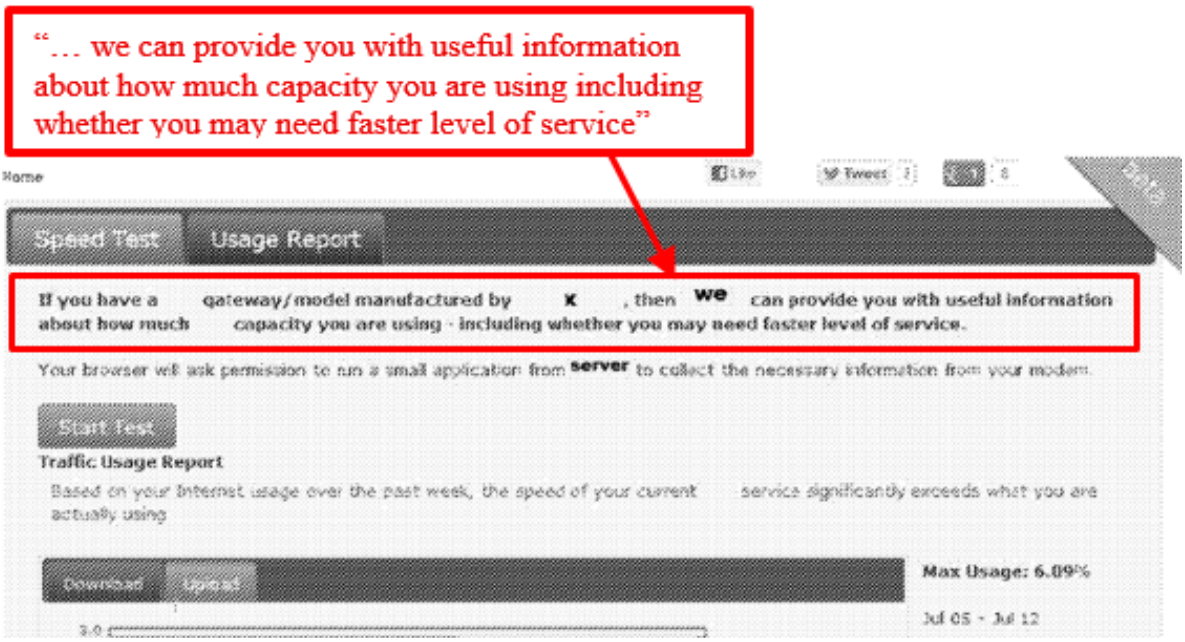
63. With respect to the WAN performance information transmitted via the downloadable agent[s], the cloud receives, stores (in a database), analyzes, and generates an analysis report, for example, an analysis report related to throughput that is sent to a broadband

subscriber and/or the broadband subscriber's service provider. *Id.* at *e.g.,* Abstract, 3:13-24, 7:23-31, 10:5-17, 10:55-62. The '654 Patent specification provides an exemplary report related to throughput, as shown below in FIG. 6A (showing "Speed Test … Download Mbps … Upload Mbps). *See id.* at *e.g.,* FIG. 6A, 14:21-36. *See also id.* at *e.g.,* 7:23-31.



'654 Patent at FIG. 6A.

64. The '654 Patent further discloses that the report may include "sending purchase information (or service product information)" to a user in order to improve/upgrade the service provided, for example, related to a user's throughput. *Id.* at *e.g.,* 8:25-29, 8:52-9:5, 10:55-63, 18:62-19:1. *See also id.* at FIG. 6B, reproduced below, reciting "we can provide you with useful information about how much capacity you are using *including whether you may need faster level of service*" (emphasis added). *See also id.* at *e.g.,* 13:42-67, 17:34-42, 20:25-34, 23:20-29, 24:37-45.



'654 Patent at FIG. 6B, excerpt, annotated.

65. Subsequent to the storing, analysis, and the aforementioned reporting, the '654 Patent discloses that via the downloadable agent, an "on-demand change request" may be sent back to the cloud (*e.g.,* server 105). *See id.* at *e.g.,* 8:61-62, 11:36-38, FIG. 1, FIG. 2. The '654 Patent further describes that the on-demand change requests may comprise a request to change throughput (for example, to increase to a faster level of service) or latency. *See id.* at *e.g.,* 8:61-9:5 (as shown below, reciting, *e.g.,* upgrading the service "… to acquire higher throughput than current throughput…"), 11:35-45, 14:6-11, 17:53-55, 19,11-13, 20:22-25 ("… on-demand change in performance …"), 23:20-29, 24:37-39, FIG. 6B (previously shown, wherein the on-demand change request may be in response to, *e.g.,* the "useful information … whether you may need a faster level of service").

> **In one embodiment, the server 105 is operable to receive an on-demand change request**. In one embodiment, the on-demand change is associated with at least one of: throughput, latency, packet loss, or jitter. For example, DA 102 of the PC 101b sends a request via connection 109 to the server 105 **to acquire higher throughput than current throughput** for its DSL line 110. In such an embodiment, the server 105 performs analysis based on available data in the database 106 and determines

> if the on-demand request by the PC 102c can be met. If it can be met, a report is provided to the DA 102 by the server 105 with information (e.g., cost etc) about how to improve throughput.

'654 Patent at 8:61-9:5, emphasis added.

B. Prosecution History of the '654 Patent

66. I have reviewed the prosecution history leading to the issuance of the '654 Patent. Notably, during prosecution, the disputed term "*collect LAN performance data from at least one of the computing device and other device*" was understood by the Examiner and was not rejected as indefinite.

C. Disputed Term of the '654 Patent – "*collect LAN performance data from at least one of the computing device and other device*" (Claims 4 and 21)

67. I understand that there is a dispute over the claim term "*collect LAN performance data from at least one of the computing device and other device*" that appears in Claims 4 and 21 of the '654 Patent. The term's use in a representative claim, *e.g.,* Claim 4 and Claim 1 that Claim 4 depends on, follows, wherein I have emphasized the term, *collect LAN performance data from at least one of the computing device and other device,* as it appears in Claim 4.

> **1.** A method performed by a downloadable agent, the method comprising:
>
> collecting WAN performance information, wherein the downloadable agent is executable on a computing device coupled to a LAN of a broadband subscriber, wherein the LAN is coupled by another device to a WAN;
>
> transmitting the WAN performance information to a machine, wherein the machine is operable to:
>
> store the WAN performance information in a database associated with the machine,
>
> analyze the WAN performance information to generate an analysis result, the analysis result comprises at least throughput; and
>
> report the analysis result to at least one of the broadband subscriber and the broadband subscriber's service provider; and

sending an on-demand change request associated with at least one of throughput, or latency.

'654 Patent at Claim 1.

> **4.** The method of claim 1 wherein the downloadable agent is operable to ***collect LAN performance data from at least one of the computing device and other device*** coupled to the LAN.

'654 Patent at Claim 4 (emphasis added).

68. Based on my analysis, I find, and in my opinion, a POSITA would plainly understand and ascertain the meaning of the claim term "*collect LAN performance data from at least one of the computing device and other device*," as I further set forth below.

1. Independent Claims 1 and 18 provide a clear antecedent basis for Dependent Claims 4 and 21 (respectively); thus, a POSITA would have clearly ascertained the claim term's meaning overall.

69. I understand that Charter questions the antecedent basis of dependent Claims 4 and 21 regarding "*the [] other device*" with respect to independent Claims 1 and 18 which recite the claim language "*the LAN is coupled by another device to a WAN*." I address the clear antecedent basis of Claims 4 and 21 below.

a. A POSITA would have been able to clearly ascertain the antecedent basis and meaning of the claim term "*collect LAN performance data from at least one of the computing device and other device*"

70. **First**, I find, and in my opinion, a POSITA would have understood that dependent Claims 4 and 21 have a clear antecedent basis back to independent Claim 1 and Claim 18 (respectively) for both the "*computing device*" and the "*another device*." Specifically, as shown in the illustration of the claim language, the "***computing device***" in independent Claims 1 and 18 -- shown in **GREEN text** – maps to the "***computing device***" in dependent Claims 4 and 21, respectively. Likewise, with respect to the "***another device***" in independent Claims 1 and 18, as shown in **RED text** "*a**nother device***" maps to the "***other device***" in dependent Claims 4 and 21,

respectively[7]. Further, the "*computing device*" and "*other device*" in dependent Claims 4 and 21 are collectively proceeded by the word "***the***" as shown in the **BLUE text** in the illustration below.

1. A method performed by a downloadable agent, the method comprising: collecting WAN performance information, wherein the downloadable agent is executable on a **computing device** coupled to a LAN of a broadband subscriber, wherein the LAN is coupled by an**other device** to a WAN; …	**18.** A system comprising: … the server operable to: receive WAN performance information from a downloadable agent, wherein the downloadable agent is executable on a **computing device** coupled to a LAN of a broadband subscriber, wherein the LAN is coupled by an**other device** to a WAN; and
4. The method of claim 1 wherein the downloadable agent is operable to collect LAN performance data from at least one of **the computing device** and **other device** coupled to the LAN.	**21.** The system of claim 18, wherein the downloadable agent is operable to collect LAN performance data from at least one of **the computing device** and **other device** coupled to the LAN.

Illustration showing the antecedent basis of dependent Claims 4 and 21 back to independent Claims 1 and 18, respectively.

71. Further, a POSITA would have understood plain English, wherein the word "*another*" is not only a synonym of the word "*other*," but also a contraction of "*an other*" in which the root word "*other*" is common to "*other*" and "*another*."

72. Thus, for the foregoing reasons, **a POSITA would easily have understood that "*the [] other device*" (*i.e.*, the device "*other*" than the "*computing device*" in dependent Claims 4 and 21) refers back to the "*another device*" (*i.e.*, the "*another device*" which is the device other than the "*computing device*" in independent Claims 1 and 18).**

[7] **Wherein the word "another" is not only a synonym of the word "other," but also a contraction of "an other" in which the root word "other" is common to "other" and "another."**

73. Moreover, a POSITA would have recognized that independent Claims 1 and 18 recite that **(1) a "*computing device*" is "*coupled to the LAN*" and that (2) the "*LAN* [is also] *coupled by another device*"** (*see* '654 Patent, Claims 1 and 18). **Thus, from the claim language in independent Claims 1 and 18, the "*device[s]*" that are explicitly said to be "*coupled to the LAN*"[8] are explicitly said to be (1) a "*computing device*" and (2) "*another device*"** (*see* '654 Patent, Claims 1, and 18). **A POSITA would have appreciated that dependent Claims 4 and 21 correspondingly recite the SAME two devices that are "*coupled to the LAN,*" *i.e.*, "*the*" (1) "*computing device*" and (2) "*other device*"** (*see* '654 Patent, Claims 4, and 21), ***i.e.*, Claims 1 and 18's (1) "*computing device*" and (2) "*another device*."**

74. Accordingly, in my opinion, a POSITA would understand that the "*another device*" recited in Claims 1 and 18 is "*the [] other device*" recited in Claims 4 and 21 (respectively). Accordingly, based on the claim language alone, in my opinion, a POSITA would have been able to clearly ascertain the antecedent basis and meaning of the claim term "*collect LAN performance data from at least one of the computing device and other device*" as I have set forth above. *See also* ¶¶ 44-46 (*supra*) with respect to the Legal Standard.

b. A POSITA would have found that the '654 Patent *specification* clearly links the "another device" in Claims 1 and 18 to the "other device" in Claims 4 and 21 (respectively)

75. **Second**, to the extent that Charter or Charter's experts argue that Claims 4 and 21 are not ascertainable based on the antecedent basis of "*the [] other device*," **I further note that the '654 Patent specification explicitly uses the terms "*another device*" and "*other device*" to mean the same in the context of "*the LAN is coupled by another device to a WAN*" as recited in independent Claims 1 and 18 to which Claims 4 and 21 depend on.** For example, in this

[8] Wherein "the LAN" in Claims 4 and 21 has a clear antecedent basis back to the same "LAN" recited in Claims 1 and 18 (respectively).

context, as I show and further illustrate below, **the '654 specification plainly states that the "*another device*" and "*other device*" are the same device (for example, the same "*e.g.,* PC 113")**. *See* '654 Patent at *e.g,* 9:62-10:4. *See also id.* at 6:55-60. I have reproduced both of these citations below. *See also* ¶ 61, *supra*.

> At block 301, the DA 102 collects WAN performance information, wherein the DA 102 is executable on a computing device (e.g., 101 c) coupled to a LAN 111 of a broadband subscriber, **wherein the LAN 111 is coupled by another device (e.g., PC 113) to a WAN 112**. At block 302, the DA 102 transmits the WAN performance information to a machine (e.g., server 105). At block 303, the DA 102 is operable to collect LAN performance data from at least one of the computing device (e.g., 101 c) **and the other device (e.g., PC 113) coupled to the LAN 111**.

'654 Patent at 9:62-10:4 (annotated, highlighted, and emphasis added) **showing that the specification explicitly maps the "another device" being "e.g., PC 113" as the "other device" being the SAME, "*e.g.,* PC 113.)**

> In one embodiment, the DA 102 is operable to collect LAN performance data from at least one of the computing device (e.g., 101b) and another device (e.g., PC 113) coupled to the LAN 111. In one embodiment, the server 105 is operable to receive the LAN performance data from the DA 102.

'654 Patent at 6:55-60 (highlighted and emphasis added). *See also id.* at FIG. 1 (PC 113).

2. Summary - "*collect LAN performance data from at least one of the computing device and other device*" (Claims 4, and 21)

76. For the foregoing reasons, I find that a POSITA would have found that the claim term "*collect LAN performance data from at least one of the computing device and other device*" as clear and concise in light of the claim term itself, and further in light of the claim(s) as a whole, and moreover in light of the specification and file history. Specifically, the claim term specifies "*collect LAN performance data*" which is clear and concise as I have discussed above, and the claim term specifies that the "*collect[ing] [of] LAN performance data*" is "*from at least one of the computing device and other device*" which is likewise is clear and concise. *See* ¶¶ 67-75, *supra.*

77. Thus, it is my opinion that there is no ambiguity regarding the meaning of the term "*collect LAN performance data from at least one of the computing device and other device"* as it

appears in Claims 4 and 21 of the '654 Patent and further Claims 1 and 18 to which Claims 4 and 21 depend on, respectively. As discussed above, a POSITA would have understood the plain and ordinary meaning of the term based on the intrinsic record. Accordingly, I do not find Claim 4 and Claim 21 indefinite.

VIII. THE '108 PATENT

A. Overview of the '108 Patent

78. The '108 Patent is titled "Systems and Methods for Jointly Optimizing WAN and LAN Network Communications" and was issued October 18, 2022 (*see* the '108 Patent at (54), (45)). Glauser Decl. Exhibit E. The '108 Patent was filed on July 11, 2020, under U.S. Patent Application No. 16/926,696 (*id.* at (21), (22)). The '108 Patent "is a continuation of and claims priority to U.S. patent application Ser. No. 16/432,364, filed on 5 Jun. 2019, [], which is a continuation of U.S. patent application Ser. No. 15/182,513, filed on 14 Jun. 2016, [], which is a continuation of U.S. patent application Ser. No. 13/995,900, filed on 8 Jul. 2014, [], which claims priority to PCT Patent Application Serial No. PCT/US2011/021003, filed on 12 Jan. 2011" (*id.* at 1:8-25; *see also id.* at (21), (22), (63), (65)).

79. Independent Claim 1 of the '108 Patent is reproduced below:

> **1.** A management device, comprising:
>
> a Local Area Network (LAN) interface to communicably interface the management device with a LAN;
>
> a Wide Area Network (WAN) interface to communicably interface the management device with a WAN, wherein the WAN is to provide broadband connectivity to the LAN;
>
> one or more processors; and
>
> a non-transitory computer-readable medium or media storing one or more sequences of instructions which, when executed by at least one of

> the one or more processors, cause the management device to perform operations comprising:
>
> collecting LAN information from one or more communication layers on the LAN; and
>
> identifying one or more operational conditions within the WAN in a different communication layer from the one or more communication layers on the LAN by analyzing at least the collected LAN information.

'108 Patent, Claim 1.

80. The '108 Patent is an invention directed at overcoming network problems within LAN/WAN systems wherein traditionally, the "WAN" was separately "controlled, managed and maintained by service providers" and "[c]onversely, a LAN" was separately "managed and maintained at a customer's premises by end users/customers" yet "some problems and issues exhibited via the LAN may be related to WAN configurations and settings" or vice versa. *See* '108 Patent at 2:3-25, which I have reproduced below. *See also id.* at 17:25-35.

> **Traditionally, the WAN is controlled, managed and maintained by service providers, such as Internet Service Providers, Telecommunications Operators, etc. Conversely, a LAN is typically managed and maintained at a customer's premises by end users/customers, which may be residential users or commercial/business customers.** Moreover, operators and service providers typically refrain from addressing any LAN related problems, notwithstanding the fact that, at times, some problems and issues exhibited via the LAN may be related to WAN configurations and settings. **Correspondingly, some problems and issues exhibited via the WAN may be related to configurations, settings or problems on the LAN side**. … Moreover, the means of control, monitoring and provisioning, as well as control channels on the two networks, WAN and LAN, are typically distinct and separate, even when the WAN and the LAN are interconnected.

'108 Patent at 2:3-24, emphasis added.

81. To overcome the limitations of the prior systems, the '108 Patented invention introduced a "management device" to, for example, to collect LAN information, analyze the LAN

information, and, accordingly, identify an "operational condition" within the WAN.[9] *See id.* at Abstract, 3:43-55 and 4:5-10. I have reproduced each of these citations below.

> Described are systems and methods for jointly optimizing Wide Area Network (WAN) and Local Area Network (LAN) network communications. **In one embodiment, a management device communicatively interfaced with a WAN and a LAN includes a collection module to collect LAN information from the LAN and WAN information from the WAN; an analysis module to jointly analyze the collected WAN information and the collected LAN information to identify an operational condition**; and an implementation nodule **to initiate a management event responsive to the operational condition being identified**. In one embodiment, the management event includes generating and transmitting a diagnostics report responsive to a fault being identified. The management device may further generate and execute instructions to remedy the diagnosed fault.

'108 Patent at Abstract, emphasis added.

> The *management device* described herein collects information collected from the WAN and LAN networks via respective WAN and LAN interfaces to such networks, **jointly analyzes the collected WAN information and the collected LAN information to identify an operational condition, and initiates a management event responsive to the operational condition being identified. For example, in some embodiments, the operational condition** identified corresponds to a fault within the LAN which is identified based at least in part on the collected WAN information or alternatively, a fault within the WAN which is identified based at least in part on the collected LAN information.

'108 Patent at 3:43-55, emphasis added.

> Using the systems and methodologies described herein, a **management device** having access and authority to collect information from a WAN connected network and also a LAN connected network is capable of collecting and jointly analyzing information from the WAN and LAN networks to jointly optimize WAN and LAN network communications.

'108 Patent at 4:5-10, emphasis added.

---

[9] Specifically, the '108 Patent is directed toward LAN/WAN networks that explicitly include network connectivity provided via, *e.g.,* "cable internet service provider" that comprises "at least partially over coaxial cable" ('108 Patent at 2:63-3:8), "service providers include … a cable operating company …. broadband communications services (… cable, etc.)" (*id.* at 6:58-67), wherein "it should be understood that the disclosed methods and apparatus [] may be applied to many other types and/or variety of communication equipment, services, technologies and/or systems … includ[ing] … wired or cable distribution systems, coaxial cable distribution systems … " (*id.* at 7:17-39), wherein "[i]n accordance with disclosed embodiments, the WAN provides Internet connectivity to a Local Area Network via one of: … [*e.g.,*] a fiber optic based network connection; a cable based network connection … " (*id.* at 12:4-13).

82. More specifically, the '108 Patent discloses that the management device may analyze LAN information to identify many different types of "operational conditions" within a WAN, for example, "faults" (*see* '108 Patent at *e.g.,* 3:43-55, reproduced above), conditions "associated with devices within either the WAN or the LAN, or associated with the communication channel [] related to the WAN and the LAN" (*id.* at 8:12-20), "historical WAN information," (*id.* at 8:49-58), "metrics" (including measurements), "trend[s]," "quality" of service measurements, "connectivity and traffic" conditions, "configurations, faults, congestion [including but not limited to *e.g.,* saturation], etc." (*id.* at 9:8-18, annotated), "excess power consumption," "bandwidth []," "security []," "performance measures, … etc." (*id.* at 10:44-60; *see also id.* at 10:30-11:18 overall), "unwanted configuration" (*id.* at 14:33-41). *See also id.* at *e.g.,* 9:56-61, 16:8-14, 16:52-55, 21:57-65, 25:24-59, FIG. 6B, and FIG. 6C. Below, I have reproduced an exemplary passage from the '108 Patent at 10:44-60 that shows some of the kinds of operational conditions that are identified by the management device.

> In accordance with various embodiments, the **operational condition identified** based on the joint analysis may include one or more of: network congestion within the WAN; network congestion within the LAN; excess power consumption by communication elements within the LAN; excess power consumption by communication elements within the WAN; bandwidth utilization of the WAN in excess of a maximum threshold; bandwidth availability of the WAN below a minimum threshold; a security breach within the LAN which is determined by observing anomalies in data traffic; a network intrusion within the LAN; a fault on the WAN or the LAN; errors on the WAN or the LAN connection; usage patterns of the WAN or the LAN resources (e.g., bandwidth, power, etc.); bandwidth utilization on the WAN or the LAN; performance measures on the WAN or the LAN; and quality of the WAN or LAN connection, such as level of stability, rate sustainability, etc.

'108 Patent at 10:44-60, emphasis added. *See also id.* at 10:30-11:18 overall.

83. Moreover, the '108 Patent discloses that the LAN information that is analyzed by the management device can be at a "different [network communication] layer" with respect to the identified WAN operational condition. *See* '108 Patent at *e.g.,* 16:62-17:18; *see also id.* at 16:62-

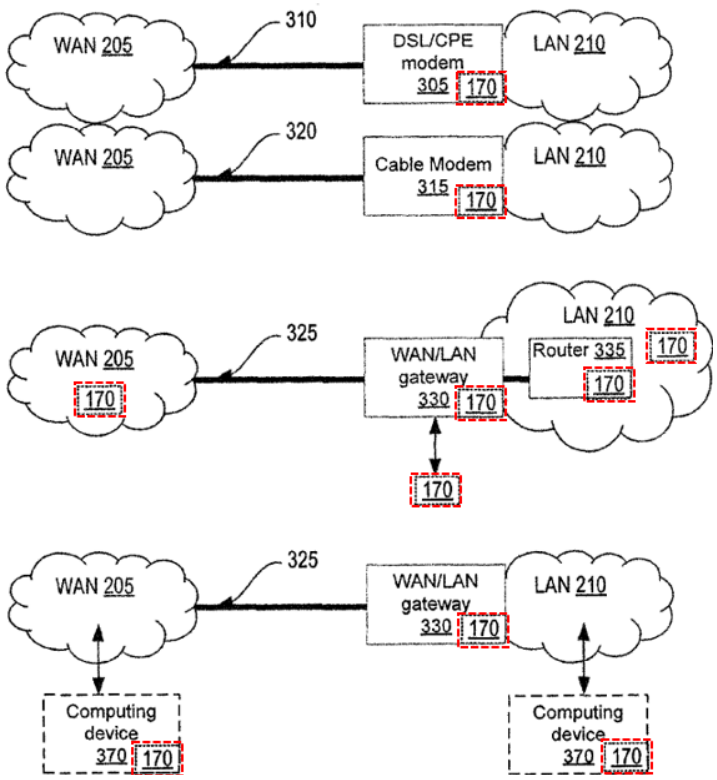
18:21 overall. In this regard, below, I have reproduced a portion of the '108 Patent specification found at 16:62-17:7.

> **In one embodiment, information collected from the LAN 210 and WAN 205 relates to two distinct communication layers**. One example of the two communication layers is two layers of the Open Systems Interconnection model (OSI model). The OSI model is a commonly used model describing the different data processing layers, in digital communication systems. The communication layers could also correspond to other communication protocols or layers such as TCP/IP which might not directly correspond to one of the layers of the OSI model.
>
> **For example, information from one layer on the WAN 205 may be used to diagnose or improve the performance on a different layer on the LAN 210, or vice versa.**

'108 Patent at 16:62-17:7, emphasis added. *See also id.* at 16:62-18:21 overall.

84. Turning to the LAN/WAN topology itself with respect to the disclosed management device, FIG. 1 and FIG. 3 of the '108 Patent show that management device "170" may be located in many different locations within a network system. *See* '108 Patent at *e.g.,* FIG. 1 and FIG. 3. For example, management device "170" may be (1) located at a customer's premise "LAN" (*e.g.,* "210") with and/or within (or communicably interfaced with) a wide variety of devices, including *e.g.,* a "Cable Modem" (*e.g.,* "315"), "Router" (*e.g.,* "335"), "WAN/LAN gateway" (*e.g.,* "330"), "bridge," other "CPE" (Customer Premise Equipment) such as a "modem" (*e.g.,* "305"), other "[c]omputing device[s]," (*e.g.,* "370"), and/or as a "standalone" device, etc.; (2) located with/within the service provider's distributed/backend system *e.g.,* as part of (or communicably interfaced with) a service provider's "Termination" system(s), "Node[s]," "Central Office," "WAN" cloud equipment (*e.g.,* "205"), "server or series of servers," "client," (etc.) further being combined within such equipment and/or as a "standalone" device; or (3) located remotely in the overall WAN network system *e.g.,* "broadband network" (*e.g.,* "106") within (or communicably

interfaced with) other "[c]omputing device[s]" (*e.g.,* "370) and/or "standalone" devices."[10] *See* '108 Patent at, *e.g.,* 6:36-45, 12:14-54, 13:10-59, 26:21-62, FIG. 1, FIG. 3, and FIG. 7. Below I have reproduced the '108 Patent's FIG. 3 and portions of the specification at 6:36-45, 12:14-54, 13:10-38, and 26:21-33.



'108 Patent at FIG. 3 showing exemplary locations/integration of management device "170," annotated.

> Depicted within FIG. 1 is management device 170 operating at various locations in accordance with several alternative embodiments. For example, management device 170 is located within home network 104, such as within a LAN. In an alternative embodiment, management device 170 is located at central office 146 and interfaced to home network 104 (e.g., a LAN) and broadband network 106 (e.g., a WAN) via NMS 116. In yet another embodiment, management device 170 operates on the broadband network 106 (e.g., on the WAN or Internet).

[10] As disclosed by the '108 Patent, such other devices *throughout* the LAN and/or WAN network system as a whole that may comprise the management device also include a "wireless modem," "Optical Network Terminal (ONT)," "personal computer (PC), a tablet PC, a set top box (STB), a Personal Digital Assistant (PDA), a cellular telephone, a web appliance, a server, a network router, switch or bridge, computing system, or any machine capable of executing a set of instructions…" *See* '108 Patent at, *e.g.,* 11:53-12:3, 26:21-33. *See also id.* at *e.g.,* 21:57-65.

'108 Patent at 6:36-45.

> The management device 170 may be implemented within and operate as an interfacing device between any such WAN based connection and a connected LAN, in which case the WAN provides Internet connectivity to the management device 170 which may additionally implement an appropriate WAN/LAN interface, such as a WAN to LAN gateway 330 or WAN/LAN bridge.
>
> The management device 170 need not necessarily operate within a modem or within a device interfacing the respective WAN and LAN networks. For example, in one embodiment, the management device is implemented within a router 335 operating to communicatively interface a WAN backhaul 325 with the LAN. In such an embodiment, the router 335 may operate within the LAN 210 and connect with the WAN back-haul 325 through a WAN/LAN gateway 330 as depicted, or alternatively, the router 335 implementing the functionality and capabilities of the management device (e.g., 170) may connect directly with a WAN back-haul 325. In some embodiments, a WAN/LAN gateway 330 device is combined with a LAN based router 335 and implements the management device capabilities.
>
> In one embodiment, management device 170 is implemented separately from a router 335, gateway device 330, computing device 370, DSL/CPE modem device 305, and cable modem 315, for example, management device 170 may operate as a standalone unit. FIG. 3 depicts various alternative deployment examples of management device 170 being implemented separately from such devices and operating within WAN 205 or within LAN 210, thus enabling management device 170 to collect information from the respective networks. Alternatively, management device 170 may be implemented separately from such devices but interface directly to another device, such as to the WAN/LAN gateway 330 as depicted or to a modem (e.g., 305, 315) or as a peripheral device attached to a computing device (e.g., 370), thus enabling management device to collect information from the respective networks and perform other operations as described herein. Other combinations are also feasible where the management device 170 is enabled to collect information from each of a WAN 205 and a LAN 210 as described herein.

'108 Patent at 12:14-54.

> In some embodiments, the management device does not operate inline with the communication channel related to the WAN and the LAN in the way that a WAN/LAN gateway 330 or a modem operating between the WAN and the LAN operates. Instead, the management device may be implemented within a computing device 370 remotely located from a WAN/LAN interface through which a communication channel related to the WAN 205 and the LAN 210 is connected.
>
> …
>
> [T]he computing device 370 need not necessarily be associated with a WAN operator, such as an ISP, providing internet services to an end-user consumer. For example, a computing device 370 that implements the management device

> functionality may operate on the Internet beyond the infrastructure owned or operated by an ISP providing the WAN back-haul 325, but nevertheless communicate with WAN based devices over the ISP's network via WAN 205 and communicate with LAN based devices via a WAN/LAN gateway 330 which connects LAN 210 to the WAN 205.
>
> ...

'108 Patent at 13:10-38. *See also id*. at 13:10-59 overall.

> The machine [comprising management device 734; *see* '108 Patent at FIG. 7 and 26:13-63] may operate in the capacity of a server or a client machine in a client-server network environment, or as a peer machine in a peer-to-peer (or distributed) network environment or as a server or series of servers within an on-demand service environment, including an on-demand environment providing database storage services. Certain embodiments of the machine may be in the form of a personal computer (PC), a tablet PC, a set top box (STB), a Personal Digital Assistant (PDA), a cellular telephone, a web appliance, a server, a network router, switch or bridge, computing system, or any machine capable of executing a set of instructions …

'108 Patent at 26:21-33, annotated. *See also id.* at FIG. 7 and 26:13-63 overall.

85. Moreover, the '108 Patent specification discloses that the management device may be integrated within various types of equipment, such as one or more cloud servers, that do not have a direct interface (*e.g.,* "does not operate inline") to the LAN and/or WAN but instead may "communicably interface[e]" (*e.g.,* "communicatively interface") "indirectly" to other "elements" that connect to and/or comprise a LAN and/or WAN interface (via for example, an indirect communicative connection to a "WAN/LAN gateway," a "router," "modem" (etc.) in various combinations). *See* '108 Patent at *e.g.,* 7:40-45, 12:21-26, 13:10-18, 24:57-63 all reproduced below. *See also id.* at *e.g.,* Abstract (previously shown), 7:63-8:1, 12:14-54, 13:10-59, 25:20-23, FIG. 6A, FIG. 6B, and FIG. 6C.

> **The phrases "coupled to," "coupled with," connected to," "connected with" and the like** are used herein to describe a connection between two elements and/or components and are intended to mean coupled/connected **either directly together, or indirectly, for example via one or more intervening elements or via a wired/wireless connection.**

'108 Patent at 7:40-45, emphasis added.

> **The management device 170 need not necessarily operate within a modem or within a device interfacing the respective WAN and LAN networks**. For example, in one embodiment, the management device is implemented within a router 335 operating to communicatively interface a WAN backhaul 325 with the LAN.

'108 Patent at 12:21-26, emphasis added. *See also id.* at 12:14-54 overall, previously shown.

> **In some embodiments, the management device does not operate inline with the communication channel related to the WAN and the LAN** in the way that a WAN/LAN gateway 330 or a modem operating between the WAN and the LAN operates. **Instead, the management device may be implemented within a computing device 370 remotely located from a WAN/LAN** *interface* through which a communication channel related to the WAN 205 and the LAN 210 is connected.

'108 Patent at 13:10-18, emphasis added. *See also id.* at 13:10-59 overall.

> Method 600A begins with processing logic for communicably interfacing a management device with a Local Area Network (LAN) and a Wide Area Network (WAN) as set forth at block 602. At block 604, processing logic collects WAN diagnostic information from a WAN and at block 606, processing logic collects LAN diagnostic information from a LAN.

'108 Patent at 24:57-63.

86. Additionally, the '108 Patent discloses that as a result of an identified "operational condition," the aforementioned management device may further initiate a "management event," for example, "a management event responsive to the operational condition." '108 Patent at Abstract (previously shown), 3:43-55 (previously shown). *See also id.* at *e.g.,* 3:43-62, 8:8-11, 9:19-33 , 9:56-10:4, 10:30-43, 11:19-39, 13:60-14:64, 15:37-18:36, 19:27-21:6, 23:55-24:56, 25:3-19, 25:24-67, 26:7-12, 26:56-63, 27:24-32, FIG 6A, FIG. 6B, and FIG. 6C. An additional exemplary citation from the '108 Patent specification (*e.g., id.* at 10:30-43) with respect to management events is reproduced below.

> **In one embodiment, the implementation module 235 initiating the management event responsive to the operational condition** being identified includes the implementation module 235 to generate instructions to remedy a fault diagnosed within the WAN or to generate instructions to remedy a fault diagnosed within the LAN based on the joint analysis, or both. **For example, in one**

> **embodiment, initiating the management event responsive to the operational condition being identified comprises the implementation module to alter one or more of the following: Forward Error Correction (FEC) parameters, a DSL transmission rate, implement a higher INP (Impulse Noise Protection) parameter setting, a higher margin parameter setting, and/or higher power parameter settings**.

'108 Patent at 10:30-43, emphasis added.

B. Prosecution History of the '108 Patent

87. I have reviewed the prosecution history leading to the issuance of the '108 Patent. Notably, during prosecution, the disputed term "WAN rate" was understood by the Examiner and was not rejected as indefinite.

C. Disputed Term of the '108 Patent – "*WAN rate*" (Claims 3, 10, and 17)

88. I understand that there is a dispute over the claim term "*WAN rate*" that appears in Claims 3, 10, and 17 of the '108 Patent. The term's use in a representative claim, *e.g.,* Claim 3,[11] follows, along with Claims 1 and 2 that Claim 3 depends on. I have emphasized the term *WAN rate* as it appears in Claim 3.

> **1.** A management device, comprising:
>
> a Local Area Network (LAN) interface to communicably interface the management device with a LAN;
>
> a Wide Area Network (WAN) interface to communicably interface the management device with a WAN, wherein the WAN is to provide broadband connectivity to the LAN;
>
> one or more processors; and
>
> a non-transitory computer-readable medium or media storing one or more sequences of instructions which, when executed by at least one of the one or more processors, cause the management device to perform operations comprising:
>
> collecting LAN information from one or more communication layers on the LAN; and

[11] The analysis provided with respect to claim 3 equally applies to claims 10 and 17.

identifying one or more operational conditions within the WAN in a different communication layer from the one or more communication layers on the LAN by analyzing at least the collected LAN information.

'108 Patent at Claim 1.

2. The management device of claim 1 wherein the operations further comprising:

initiating a management event responsive to at least one of the one or more operational conditions being identified.

'108 Patent at Claim 2.

3. The management device of claim 2 wherein initiating the management event comprises one or more of:

decreasing ***WAN rate*** to improve link stability and quality;

increasing one or more Impulse Noise Protection (INP) parameter settings; and

increasing one or more margin parameter settings.

'108 Patent at Claim 3 (emphasis added).

89. I understand that Charter asserts that the term "*WAN rate*" is indefinite. To the contrary, I find the term *WAN rate* has a plain and ordinary meaning, as I explain in detail below. Specifically, I find, and in my opinion, a POSITA would have unambiguously understood *WAN rate* (*i.e., WAN* data *rate*) to have a plain and ordinary meaning, based on the '108 Patent's intrinsic evidence including at least each of (1) the claim term itself, (2) the claim term in light of the claim(s) as a whole, (3) the claim term in light of the '108 Patent specification and file history — as I further discuss below. The plain and ordinary meaning of the term *WAN rate* is further confirmed by (4) Charter's own expert, Dr. Houh, as I further discuss below. The plain meaning and ordinary meaning of the term *WAN rate* is further made clear based on (5) the extrinsic evidence as I discuss below.

1. The claim term "*WAN rate*" plainly informs and would have informed a POSITA as to its plain and ordinary meaning

90. First, with respect to the claim term "*WAN rate*" itself, a POSITA well-understood that a network, *e.g.,* a "WAN" (Wide Area Network) – is for communicating data. Thus, it was plainly understood the data rate of the WAN – the *WAN rate* – was the *WAN* data *rate*. The term WAN rate was customarily used with this meaning at the time of the invention and continues to be used with this meaning today.

91. A POSITA (at the time of the earliest possible priority date) was well aware that the *WAN rate* was expressed in bits/second. For example, commonly known *WAN rates* included such *WAN rate*s as 10 Mbps (10 million bits per second), 100 Mbps, 1 Gbps, etc.

92. Thus, the claim term *WAN rate* (*i.e., WAN* data *rate*) plainly informs and would have informed a POSITA as to its plain and ordinary meaning of the term.

2. A POSITA would further have had a plain and ordinary understanding of the term "*WAN rate*" based on reading the claim language as a whole

93. Second, with respect to the claim term "*WAN rate*," as used in the claims as a whole, the term *WAN rate* appears in Claims 3, 10, and 17 of the '108 Patent, within the same following common claim language:

> … management event comprises one or more of:
>
> **decreasing** *WAN rate* **to improve link stability and quality**.

See '108 Patent, Claims 3, 10, and 17 (emphasis added).

94. The claim language, for example, "**decreasing *WAN rate* to improve link stability and quality**" makes abundantly clear to a POSITA that "decreasing" the "***WAN rate***" (*i.e.,* the *WAN* data *rate*) was an example of the claimed "management event" action to "**improve link stability and quality**." Accordingly, a POSITA would have understood that higher *WAN rate*s – such as 10 Gbps – would be prone to cause a higher error rate (*e.g.,* lower communication link

quality) as compared to a lower *WAN rate* – such as 1 Mbps – which would be comparatively prone to cause a lower error rate (*e.g.,* higher communication link quality). Thus, in order to improve the communication link stability and quality, **a POSITA would appreciate by simply reading the claim language, that "decreasing *WAN rate*" meant decreasing the *WAN* data *rate***.

95. Accordingly, a POSITA (at the earliest possible priority date) would further have a plain and ordinary understanding of the term *WAN rate* (*i.e. WAN* data *rate*) based on reading the claims (*i.e.,* Claims 3, 10, and 17 of the '108 Patent) as a whole.

3. A POSITA would have had a plain and ordinary understanding of the claim term "*WAN rate*" in light of the '108 Patent specification.

96. Third, regarding the claim term "*WAN rate*," in light of the specification and file history, I find that the '108 Patent specification provides many examples wherein the *WAN rate* is said to be the *WAN* data *rate*, *i.e.,* the data *rate* of the *WAN*.

97. In more detail (*see also* ¶¶ 93-95, *supra*), Claims 3, 10, and 17 are directed toward enacting a "management event" which may include **"decreasing" the *WAN* data *rate* in order to improve the stability and quality of the communication link as stated in the claims as follows**:

1) "… **initiating a management event** responsive to at least one of the one or more operational conditions …" ('108 Patent, Claims 2, 9, and 16 (emphasis added)),

2) "… **the management event** comprises one or more of: **decreasing *WAN rate* [*i.e.,* the *WAN* data rate] to improve link stability and quality**." ('108 Patent, Claims 3, 10, 17 (emphasis added)),

98. **A POSITA would have plainly understood by simply reading the '108 Patent specification that the '108 Patent specification[12] provides direct support for this claim language, wherein the claim term *WAN rate* is explicitly said to be the "*WAN* data *rate.*"** Specifically, as a POSITA would have fully understood — the '108 Patent specification discloses, repeatedly — that the *WAN* data *rate* (and decrease and/or increase thereof) has a direct impact on the communication link quality[13] consistent with the claim language for Claims 3, 10, and 17, and the claims that they depend on (Claims 1, 2, 8, 9, 15, 16). *See e.g.,* the '108 Patent at *e.g.,* 10:30-43, 15:37-62, 16:8-28, 16:40-51, 17:47-55, 18:3-11, 18:21-28, 19:16-21, 20:11-21, Claims 4, 11, and 18. I show and explain each of these citations below:

> **DSL links are more susceptible to noise and other impairments when operating at high data rates because they are typically operating at lower margins. In such a case, Management device 170 initiates a management event, sending instructions to the *WAN* (such as DSL controller) to lower the *data rate* on the WAN side, making the *WAN* connection more stable**. Additionally, a mismatch between the WAN and the LAN throughputs may cause errors on both networks due to the overloading of buffering mechanisms on the gateways between the WAN and the LAN.

'108 Patent at 20:11-21 (emphasis added), **consistent[14] with Claims 3, 10, and 17, discussing "lower[ing]" the "*WAN*" "*data rate*" (*i.e., WAN rate*) to improve communication link stability and quality (*e.g.,* "making the *WAN* connection more stable")**.

> **In a particular case, where the *WAN* 205 is a DSL connection**, the DSL link settings and configuration could be changed, for example, initiating the change as a management event responsive to the above analysis. DSL connection setting may be implemented at the physical layer. For example, the DSL coding may be improved by adjusting the Forward Error Correction (FEC) parameters (e.g.,

[12] And file history, which provides the same disclosures. *See* '108 Patent File History at *e.g.,* ASSIA_CHARTER-00011071-00011140. Thus, when I recite the '108 Patent specification herein in this Declaration, the '108 Patent File History likewise supports my findings. Moreover, when I refer to the '108 Patent specification, I am also referring to at least those citations that I identify in my '108 Patent Overview section (¶¶ 78-86, *supra*).

[13] As I have already discussed above. *See e.g.,* ¶¶ 93-95, *supra.*

[14] When I say "consistent," I am simply pointing out that varying the *WAN* data *rate* impacts, *e.g.,* communication link stability and quality, as I have already explained. *See e.g.,* ¶¶ 93-95, *supra.*

> channel coding). Alternatively, **DSL [*WAN*] *rate* may be decreased to improve link stability and quality.**

'108 Patent at 17:47-55 (annotated and emphasis added), **consistent with Claims 3, 10, and 17, discussing varying the *WAN, e.g.,* "DSL" "*rate*" (*i.e., WAN rate* for *e.g.,* DSL) to impact communication "link stability and quality**.**" In the context of this embodiment, the DSL connection is a type of WAN.

> For example, the DSL coding may be improved by adjusting the FEC [Forward Error Correction] parameters, **the DSL [*WAN*] *rate* may be decreased to improve the link stability and quality**, or the INP settings may be changed to guard against impulse noise, or margin parameter settings could be improved, and/or power settings.

'108 Patent at 19:16-21 (annotated and emphasis added), **consistent with Claims 3, 10, and 17, discussing varying the *WAN, e.g.,* "DSL" "*rate*" (*i.e., WAN rate* for *e.g.,* DSL) to impact communication "link stability and quality**.**"

> Take for example, a video streaming system where an MPEG (Moving Picture Experts Group) data stream is received with errors at the receiving side on the LAN 210. One or more of channel coding parameters, INP (Impulse Noise Protection) parameters, margin parameter settings, power parameter settings, and/or **data *rate* parameters for the DSL [*WAN*] connection may be altered or modified to compensate for the receiving side errors in the video data stream.**

'108 Patent at 18:3-11 (annotated and emphasis added), **consistent with Claims 3, 10, and 17, discussing varying the *WAN, e.g.,* "DSL" "data *rate*" (*i.e., WAN rate* for *e.g.,* DSL) to impact communication link stability and quality (*e.g.,* impact "errors").**

> **In such an example, DSL system settings (e.g., settings and parameters on the WAN 205) may be set to stabilize the *WAN* DSL connection(s).** For example, a new profile or DSL system configuration settings may be set on the DSL system, including, for example: improved coding, higher INP (Impulse Noise Protection) parameter setting, improved margin parameter settings, power parameter settings, and/or **a lower data *rate***.

'108 Patent at 18:21-28 (emphasis added), **consistent with Claims 3, 10, and 17, discussing varying the "*WAN*" "data *rate*" (*i.e., WAN rate*) to impact communication link stability and quality (*e.g.,* "to stabilize the WAN [] connection(s)").**

> … **initiating the management event** … generating instructions **to modify one or more parameters affecting … *WAN* data *rate***; …

'108 Patent at Claims 4, 11, and 18 (emphasis added), **consistent with Claims 3, 10, and 17, giving yet another example of a management event used to vary the *WAN* data *rate* (*i.e., WAN rate*).**

> In one embodiment, the implementation module 235 **initiating the management event responsive to the operational condition** being identified includes the implementation module 235 to generate instructions **to remedy a fault diagnosed within the WAN** or to generate instructions to remedy a fault diagnosed within the LAN based on the joint analysis, or both. **For example, in one embodiment, initiating the management event responsive to the operational condition being identified comprises** the implementation module to alter one or more of the following: Forward Error Correction (FEC) parameters, a **DSL [*WAN*] transmission *rate***, implement a higher INP (Impulse Noise Protection) parameter setting, a higher margin parameter setting, and/or higher power parameter settings.

'108 Patent at 10:30-43 (emphasis added), **consistent with Claims 3, 10, and 17, discussing varying the *WAN, e.g.,* "DSL" "*rate*" (*i.e., WAN rate* for *e.g.,* DSL) to impact communication link stability and quality (*e.g.,* "to remedy a fault").**

> In accordance with embodiments of the invention, **initiating a management event responsive to the operational condition** being identified includes the management device 170 (e.g., via its implementation module) **may perform one or more of the following operations: … generate instructions to modify one or more parameter**s affecting WAN forward error correction (FEC), WAN latency, WAN transmit power levels, and ***WAN* data *rate***, based on the collected LAN information; … .

'108 Patent at 15:37-62 (emphasis added), **consistent with Claims 3, 10, and 17, discussing varying the "*WAN* data *rate*" (*i.e., WAN rate*) to impact communication link stability and quality (*e.g.,* "responsive to the operational condition").**

> **The above optimizations may alternatively implement or trigger LAN or WAN configuration changes** that alter network characteristics. **For example, a WAN configuration may be modified based on collected LAN information that identifies an operational condition** within the LAN that corresponds to usage or consumption of a particular class of network traffic. For example, where it is determined that streaming video is being actively consumed by a LAN device, management device 170 may responsively **configure the *WAN* to implement a higher data *rate* connection with minimized data correction** where a streaming video may benefit from an increased **data** *rate* and may not be adversely affected by a minimized correction scheme (e.g., stream errors may generate momentary pixilation but may not require correction as the errored frame likely has already passed, and thus, may not be referenced again or even referenceable, by the time correcting data is provided). **Conversely, a particular class of data may benefit from minimized latency such as VoIP data which requires a low data *rate,*** but may frustrate human users where a delay attributable to network latency is present.

'108 Patent at 16:8-28 (emphasis added), **consistent with Claims 3, 10, and 17, discussing varying the "*WAN*" "data *rate*" (*i.e., WAN rate*) to impact communication link stability and quality (*e.g.,* discussing tradeoffs of "WAN" "data rates" and "errors" for different types of content).**

> For example, a LAN device may overload a WAN back-haul connection by providing data faster than the WAN is capable of transmitting traffic. **In such an instance, network communications may be optimized by reducing the data *rate* at which LAN information is provided to the *WAN***. Aligning these ***rates*** may reduce collisions and buffering errors due to a traffic backlog. The opposite may equally be true. A WAN back-haul may be capable of providing data to a LAN device faster than the LAN device itself can process the data, thus creating an un-optimized mismatch from the WAN to the LAN device, and thus providing an opportunity for joint optimization.

'108 Patent at 16:40-51 (emphasis added), **discussing varying the "*WAN*" "data *rate*" (*i.e., WAN rate*) via the LAN, to impact communication link stability and quality (*e.g.*, "network communications may be optimized").**

See also id. at 9:2-18, 15:63-16:3, 16:8-51, 17:36-18:36, 19:52-20:37, 21:40-56, Claims 1, 2, 8, 9, 15, and 16.

99. Thus, in my opinion, a POSITA would have had a plain and ordinary understanding of the claim term *WAN rate* in light of the specification as I have set forth above.

4. Charter's expert, Dr. Houh, testified that he understood the plain and ordinary meaning of the term "*WAN rate*"

100. Fourth, I note that Charter's expert, Dr. Houh, testified that he understood the plain and ordinary meaning of the term *WAN rate*. Specifically, with respect to the '108 Patent IPR proceeding IPR2025-00087, **Charter's expert, Dr. Houh, plainly understood, and never questioned a POSITA's understanding of "*WAN rate*" but rather Dr. Houh instead stated that with respect to the '108 Patent, "Claim 3" for the term "*WAN rate*" a "POSITA would have understood these parameters [*i.e.,* inclusive of parameter *WAN rate*] may be increased and decreased."**[15] *See*, Charter (*et al*.) IPR2025-00087 - Exhibit 1003 (Houh Declaration), at *e.g.*, pp. 73-75 (Claim 3 heading and ¶¶187-191, annotated and emphasis added) and *e.g.,* p. 40 (Claim 3 heading and ¶106). Glauser Decl. Exhibit Y. In fact, as just one example, Dr. Houh directly

[15] Wherein Dr. Houh explicitly cited "Chow" and separately "Wiley" as purported prior art that purportedly makes the same "*WAN rate*" disclosure. *See* Charter (*et al*.) IPR IPR2025-00087 - Exhibit 1003 (Houh Declaration), at *e.g.,* pp. 73-75 ("Claim 3" heading and ¶¶187-191) and *e.g.,* p. 40 ("Claim 3" heading and ¶106).

corresponded "*WAN rate*" within Chow's DSL system to "DSL rate" without ever suggesting that Dr. Houh did not understand his own reference to Chow. *See* Charter (*et al.*) IPR IPR2025-00087 - Exhibit 1003 (Houh Declaration), at *e.g*, p. 40 (Claim 3 heading and ¶106). I have reproduced a number of these relevant excerpts from Dr. Houh's declaration below.

> **[Claim 3] The management device of claim 2 wherein initiating the management event comprises one or more of: decreasing WAN rate to improve link stability and quality; increasing one or more Impulse Noise Protection (INP) parameter settings; and increasing one or more margin parameter settings.**
>
> 106. Chow-669 discloses:
>
> "Alternatively, *DSL rate may be decreased to improve link stability and quality. Other management events could include higher INP (Impulse Noise Protection) parameter setting, improved margin parameter settings* and/or power parameter settings." (Ex-1004-Chow, 0078.)

Charter (et al.) IPR IPR2025-00087 - Exhibit 1003 (Houh Declaration), at p. 40 (highlighted).

> **[Claim 3] The management device of claim 2 wherein initiating the management event comprises one or more of: decreasing WAN rate to improve link stability and quality; increasing one or more Impulse Noise Protection (INP) parameter settings; and increasing one or more margin parameter settings.**
>
> …
>
> …
>
> 191. A POSITA would have understood that these parameters may be increased or decreased, as appropriate given the observed performance. Increasing and decreasing performance parameters like transmission rate and transmit power were well known. (*See, e.g.*, Ex-1006-Wiley, 0313 ("network performance information may be used to dynamically alter some performance parameters of the Physical Link, such as transmit power."); Ex-1008-Tanenbaum, 535-41 (explaining that it was typical to decrease transmission rate as part of achieving a fair operating point).)

Glauser Decl. Exhibit Y, Charter (et al.) IPR IPR2025-00087 - Exhibit 1003 (Houh Declaration), at pp. 73, 75 (highlighted).

5. The extrinsic evidence supports the plain and ordinary meaning of the claim term "*WAN rate*"

101. Fifth, the extrinsic evidence supports the plain and ordinary meaning of "*WAN rate*" being the *WAN* data *rate*. Specifically, prior to the earliest possible priority date, and still today, a POSITA, in the context of computer networks and telecommunications, understood the plain and ordinary meaning of "*WAN rate*" to be the data rate of the WAN (*WAN* data *rate*) as shown in the ample extrinsic record as I further set forth below.

102. Glauser Decl. Exhibit O (ASSIA_CHARTER-00032841-00032853) is a true and correct copy of a 1999 IEEE[16] presentation entitled "**LAN and *WAN Rate* 10 GigE**" that I downloaded from an IEEE website. This presentation was presented during an "IEEE 802.3 High Speed Study Group September 1999 Interim meeting," as further shown in the agenda, a true and correct copy of which I have provided as Glauser Decl. Exhibit P (ASSIA_CHARTER-00033222-00033224).[17] Specifically, this presentation relates to the "IEEE 802.3" Ethernet collection of standards for computer networks. **Starting with the presentation's title ("LAN and *WAN Rate* 10 GigE") the presentation clearly documents the plain and ordinary use and understanding (in 1999) of "*WAN rate*" — for example, for a "10Gig" (10 Gigabit/second) *WAN* data *rate* via an "E" (Ethernet) network**. *See* Exhibit O at *e.g.,* 1 (ASSIA_CHARTER-00032841) (shown below), and Exhibit P at 2 (ASSIA_CHARTER-00033223).

[16] Institute of Electrical and Electronics Engineers – **an authoritative body.**
[17] *See* links: https://grouper.ieee.org/groups/802/3/10G_study/public/sept99/index.html, and https://grouper.ieee.org/groups/802/3/10G_study/public/sept99/bottorff_1_0999.pdf, last visited December 3, 2024.

LAN and WAN
Rate 10 GigE

IEEE 802.3
Sept. 27, 1999

Glauser Decl. Exhibit O (ASSIA_CHARTER-00032841-00032853) at 1 (highlighted) shows the plain and ordinary use and understanding of "*WAN Rate*," *i.e.,* a "10Gig[bps]" *WAN* data *rate*.

103. Glauser Decl. Exhibit Q is a true and correct copy of another IEEE document available on an IEEE website.[18] Specifically, Exhibit Q contains "Comments" from an IEEE standard working group for a — at the time in 2003 — new draft of the IEEE "802.3ah" standard. The IEEE 802.3ah standard is part of the Ethernet collection of standards for computer networks. **As the excerpt below shows, the IEEE standards body equated the meaning of "*WAN rate*" to mean "data *rate* of the *WAN*"** (*i.e.,* the body proposed rewording a sentence in the 802.3ah standard by changing "***WAN rate*** adaption" to "adapt it to the **data rate of a WAN**" **as meaning the same thing**). *See* Exhibit Q (ASSIA_CHARTER-00033258-00033540) at 31 of 283 (ASSIA_CHARTER-00033288).

[18] *See* link: https://www.ieee802.org/3/efm/public/comments/d2_0/D2_0_comments_responses_091403.pdf, last visited December 4, 2024. The date in the comments link is "091403" (September 14, 2003).

Cl **04** *SC* **4.2.8** *P* **17** *L* **1** # **175**
Squire, Matt Hatteras Networks

Comment Type **E** *Comment Status* **D**

I have a very difficult time parsing this sentence. Interframe spacing can be used to lower the rate
a) in full duplex mode
1) when its necessary for WAN rate adaptation
b) in full duplex mode
1) when using FEC

SuggestedRemedy

Seems like this sentence could be easier...
Inteframe spacing may be used to lower the average data rate of a MAC when that MAC is operating at at 1000 Mbps in full duplex mode, and either when it is necessary to adapt it to the data rate of a WAN-based physical layer, or when it it necessary to adapt it to the data rate of a physical layer using FEC.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.

IEEE Standards Working Group, P802.3ah Draft 2.0 Comments, 2003 (Glauser Decl. Exhibit Q, ASSIA_CHARTER-00033258-00033540) at 31 of 283 (ASSIA_CHARTER-00033288) (highlighted) equating "*WAN rate*" to "data *rate* of the *WAN*").

104. Glauser Decl. Exhibit R (ASSIA_CHARTER-00033246-00033257) is a true and correct copy of a 2005 IEEE article by Zemlianov et al., published in Proceedings IEEE 24th Annual Joint Conference of the IEEE Computer and Communications Societies, that I purchased on the IEEE website entitled "Cooperation and decision-making in a wireless multi-provider setting". **The excerpt of the article below shows and describes the plain and ordinary use and understanding (in 2005) of the term "*WAN rate*" being the *WAN* data *rate* (*e.g.*, "Mbps").** *See* Exhibit R at Fig. 9 (ASSIA_CHARTER-00033256).

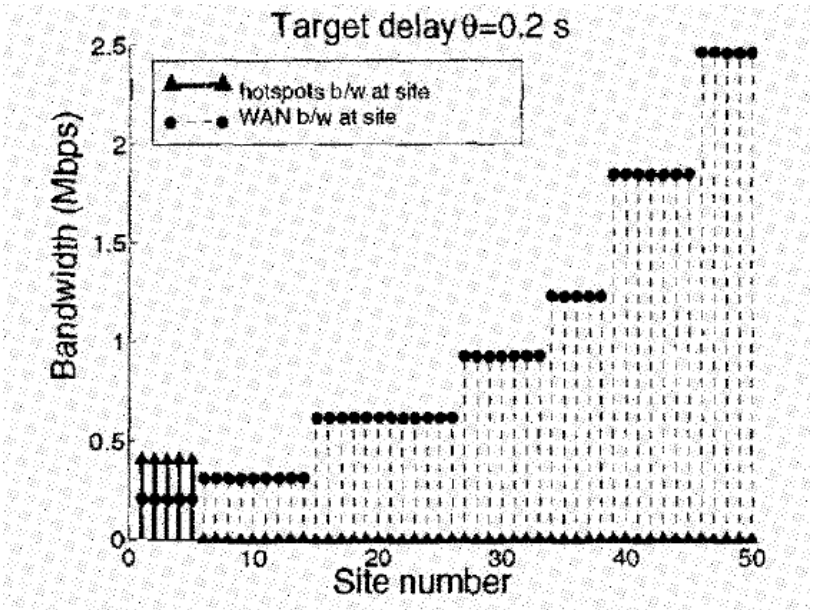
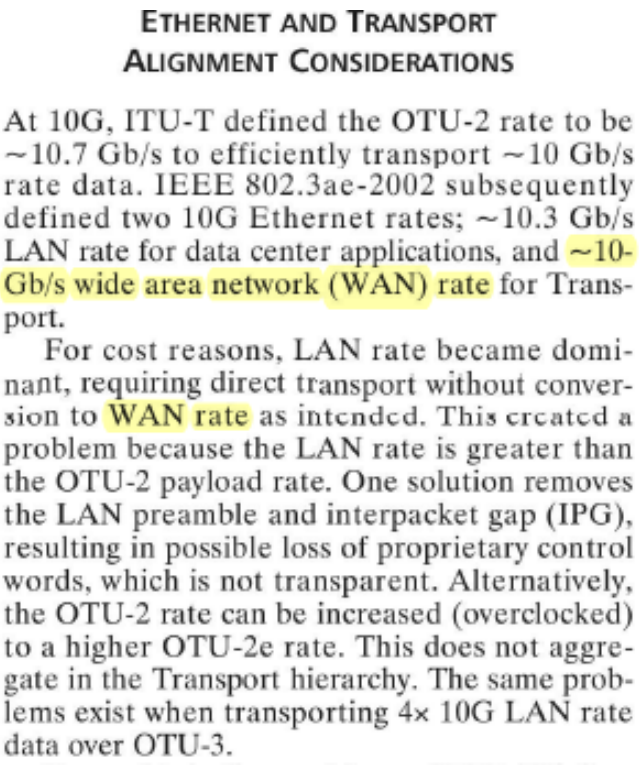


Fig. 9. Distribution of hotspots' backhaul across sites: the dashed stems with circular endings show (ordered) WAN rate at each of the 50 sites, the solid stems with triangular endings – the (optimized) bandwidth for hotspots installed at these sites.

Zemlianov, "Cooperation and decision-making in a wireless multi-provider setting," IEEE, 2005 (Glauser Decl. Exhibit R, ASSIA_CHARTER-00033246-00033257) at Fig. 9 (ASSIA_CHARTER-00033256) (highlighted) showing the plain and ordinary use and understanding of the term "*WAN rate*."

105. Glauser Decl. Exhibit S (ASSIA_CHARTER-00033225-00033233) is a true and correct copy of an article by Cole that I purchased from the IEEE website, titled "Beyond 100G Client Optics," that appeared in the "IEEE Communications Magazine" in 2012. This article provides another example of the plain and ordinary use and understanding of the term "*WAN rate*." The article discusses the 2002 "802.3ae-2002" multi-gigabit Ethernet optics standard. *See* Exhibit S at 562 (ASSIA_CHARTER-00033229). **Specifically, the article discusses the IEEE 802.3ac-*2002* standard with respect to aligning the "LAN rate" to the "*WAN rate*" being, *e.g.*, "~10 Gb/s" (*i.e.*, ~ 10 Gbps *WAN* data *rate*).** I show an excerpt of this article below. *See* Exhibit S at 562 (ASSIA_CHARTER-00033229).



ETHERNET AND TRANSPORT
ALIGNMENT CONSIDERATIONS

At 10G, ITU-T defined the OTU-2 rate to be ~10.7 Gb/s to efficiently transport ~10 Gb/s rate data. IEEE 802.3ae-2002 subsequently defined two 10G Ethernet rates; ~10.3 Gb/s LAN rate for data center applications, and ~10-Gb/s wide area network (WAN) rate for Transport.

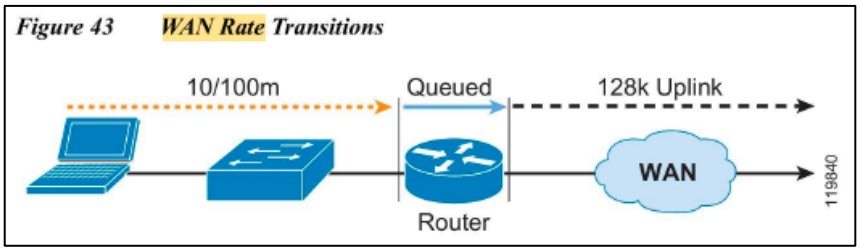
For cost reasons, LAN rate became dominant, requiring direct transport without conversion to WAN rate as intended. This created a problem because the LAN rate is greater than the OTU-2 payload rate. One solution removes the LAN preamble and interpacket gap (IPG), resulting in possible loss of proprietary control words, which is not transparent. Alternatively, the OTU-2 rate can be increased (overclocked) to a higher OTU-2e rate. This does not aggregate in the Transport hierarchy. The same problems exist when transporting 4× 10G LAN rate data over OTU-3.

Cole, Beyond 100G Client Optics, IEEE Communications Magazine, 2012 (Glauser Decl. Exhibit S, ASSIA_CHARTER-00033225-00033233) at 562 (ASSIA_CHARTER-00033229) (highlighted).

106. Glauser Decl. Exhibit T (ASSIA_CHARTER-00032984-00033034) is a true and correct copy of a publication titled "Campus Network for High Availability Design Guide" that was published by Cisco Systems in 2008.[19] This publication states that it is "intended for customers and enterprise systems engineers who are building or intend to build an enterprise campus network[.]" Exhibit T at 2 (ASSIA_CHARTER-00032985). It provides another example of the plain and ordinary use and understanding of the term "*WAN rate*." **Specifically, the Cisco Systems "Design Guide" documented the plain and ordinary use and understanding of the term "WAN rate" – a term that in 2008 was understood to define the *WAN* data *rate*, for example,**

[19] *See* link: https://www.cisco.com/c/dam/en/us/td/docs/solutions/Enterprise/Campus/HA_campus_DG/hacampus-dg.pdf, last visited December 4, 2024.

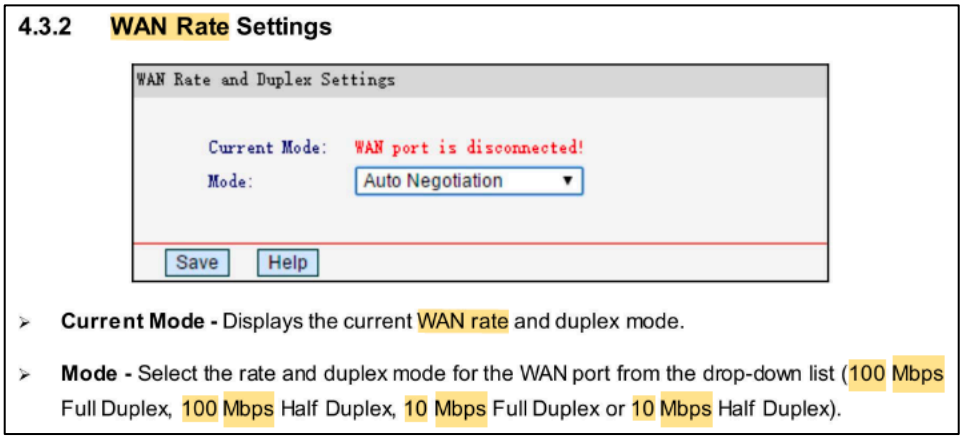
a "*WAN rate*" of "128k" (128 kbps) as shown in "Figure 43." *See* Exhibit T at 52 (Figure 43) (ASSIA_CHARTER-00033035).



Glauser Decl. Exhibit T at 52 (Fig. 43) (ASSIA_CHARTER-00033035) (highlighted).

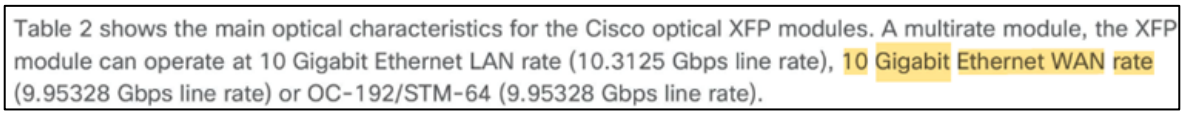
107. Glauser Decl. Exhibit U (ASSIA_CHARTER-00033541-00033607) is a true and correct copy of a 2016 user manual for a wireless router for use in computer networks supplied by Mercusys, titled "User Guide [for a] Wireless N Router," that I downloaded.[20] This user guide provides another example of the plain and ordinary use and understanding of the term "*WAN rate*." **Specifically, the User Guide instructs general users (*i.e.*, someone less skilled than a POSITA) on how to read and select the "*WAN rate*" *e.g.*, "10 Mbps … or 10 Mbps" settings. Thus, the User Manual shows that even general users understood the meaning of the term "*WAN rate*" (*i.e., WAN* data *rate*).** *See* Exhibit U at 17 (ASSIA_CHARTER-00033562), excerpted below.

[20] *See* link: https://www.manualslib.com/manual/1210485/Mercusys-Mw155r.html#manual, last visited December 4, 2024. *See also* link: https://static.mercusys.com/manual/1910080030_MW155R(EU)_V1_UG.pdf, last visited January 17, 2025, which is the same version "REV1.0.0 1910080030" of the User Manual.



Glauser Decl. Exhibit U at 17 (ASSIA_CHARTER-00033562) (highlighted).

108. Glauser Decl. Exhibit V (ASSIA_CHARTER-00033608-00033615) is a true and correct copy of a 2020 Cisco Systems "Data Sheet [for] 10 Gigabit Ethernet [] Applications" that I downloaded.[21] This datasheet describes the Cisco XFP Module, which is a transceiver that connects fiber optic and 10 Gigabit Ethernet networks. Exhibit V at 3 (ASSIA_CHARTER-00033610). The Cisco data sheet further shows the plain and ordinary use and understanding of the term "*WAN rate*" — a term that was and (in 2020) continued to be well understood. **For example, the data sheet states a "10 Gigabit Ethernet *WAN rate*" (*i.e.*, a *WAN* data *rate* of 10 Gbps).** *See* Exhibit V at 5 (ASSIA_CHARTER-00033612).



Glauser Decl. Exhibit V at 5 (ASSIA_CHARTER-00033612) (highlighted).

109. As yet another example, Glauser Decl. Exhibit W (ASSIA_CHARTER-00032976-00032983) is a true and correct copy of a product brief for a Brocade 7840 Extension Switch that I downloaded.[22] The Brocade 7840 Extension Switch is a network device that transmits data over

[21] *See* link: https://www.cisco.com/c/en/us/products/collateral/interfaces-modules/10-gigabit-modules/product_data_sheet0900aecd802a61b9.pdf, last visited December 4, 2024.
[22] *See* link: https://docs.broadcom.com/doc/GA-DS-1871, last visited December 4, 2024.

WAN links. Exhibit W at 1-3 (ASSIA_CHARTER-00032976-00032978). This document shows the plain understanding and use of the term "*WAN rate*" such as "5 Gb/s to 40 Gb/s." Exhibit W at 2 (ASSIA_CHARTER-00032977).

> Designed for maximum flexibility, this enterprise-class extension switch offers pay-as-you-grow scalability with capacity-on-demand upgrades. To meet current and future requirements, organizations can quickly and cost-effectively scale their WAN rate from 5 Gb/s to 40 Gb/s per platform via software licenses. With compression enabled, organizations can scale up to 80 Gb/s application throughput, depending on the type of data and the characteristics of the WAN connection.

Glauser Decl. Exhibit W at 2 (ASSIA_CHARTER-00032977) (highlighted).

6. Summary - "*WAN rate*" (Claims 3, 10, and 17)

110. Thus, for the foregoing reasons, I do not find any ambiguity regarding the meaning of the term "*WAN rate"* as it appears in Claims 3, 10, and 17 of the '108 Patent. As discussed above, a POSITA would have understood that the intrinsic record supports the plain and ordinary meaning, as further supported by the extrinsic record. Accordingly, I do not find the term to be indefinite.

IX. ADDITIONAL REMARKS

111. I currently hold the opinions expressed in this Declaration, but my analysis may continue, and I may acquire additional information and/or attain supplemental insights that may result in added observations. Additionally, I reserve the right to rely on additional discovery that may occur after this Declaration is submitted. To the extent that additional information becomes

available relevant to the opinions expressed in this Declaration I will update my opinions as appropriate.

112. I also reserve the right to respond to any additional arguments or opinions raised by Charter or Charter's expert(s). I further reserve the right to respond to any new positions raised by Charter or respond to any further expert declarations or reports provided by Charter regarding claim construction-related issues or any additional Court rulings that may affect my opinions in this Declaration.

X. DECLARATION

I hereby declare that all statements made are of my own knowledge, are true, and that all statements made on information and belief are believed to be true. I further declare that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of the Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this proceeding.

Dated: February 5, 2025 By: 

Richard A. Kramer Ph.D.
Salem, Oregon

APPENDIX A – C.V. OF DR. RICHARD A. KRAMER

RICHARD A. KRAMER, PH.D.
Phone: (541) 602-2271
email: Richard.Kramer@SISDevelopment.com

EXECUTIVE SUMMARY

Accomplished industry technical expert/leader with 40+ years of experience and academic excellence achievement. Top technology leader for the introduction of new technologies in the areas of network communications, video, video compression/encoding, multimedia, streaming media, wireless communications, wireless networks, AI (Artificial Intelligence), machine learning, embedded systems/integrated circuits/System-On-a-Chip (SoC) design, cryptography, encryption, authentication, digital rights, physical security (video surveillance, cameras, digital video recorders, burglar alarm systems, intelligent locks, monitoring software), Internet/web-based client-server/cloud architectures, and advanced software.

PROFESSIONAL EXPERIENCE

SIS DEVELOPMENT INC. 2006-PRESENT

President

- Leader/owner of SIS Development, Inc. ("SIS")/Security Industry Services Inc. SIS is an engineering and technical services company that serves leading product and software companies.
- Technology leader that introduced cutting-edge new technologies into formidable, respected corporations resulting in the launch of new product lines, solutions, and systems.
- Called upon and served as an intellectual property technical expert for many reputable companies/organizations including Google, Sony, Apple, Netflix, Cisco, Canon, FLIR Systems, AT&T, ASUS Computer, American Express, Honeywell, the US Department of Justice, etc.
- As a testifying expert, provider of intellectual property expertise for matters related to advanced technologies including communications, Internet technologies, networking, protocols, video (video encoding/compression, multimedia, streaming, bandwidth optimization, video analytics, network transport, targeted advertising), multimedia systems, cable TV systems, satellite systems, integrated circuits/SoC/chip design, physical security systems (video surveillance, smart homes, burglar alarm systems, access control systems), AI/machine learning, wireless systems, software including source code/source code reviews, etc.

GENERAL ELECTRIC, GE-SECURITY 2003 - 2007

Vice President, Engineering/General Manager – Technology

Leader of a progressive 300+ person technology and engineering organization that included 16 organizations in 11 geographically dispersed locations. Responsible for technology development for $500M+/year in products worldwide for General Electric's Video Systems Group (VSG) and other advanced Enterprise/Commercial/Residential solutions: video surveillance (IP network video products and software, AI video detection systems, DVRs, cameras), burglar alarm

systems (ITI, CADDX, and other lines), burglar alarm monitoring software (MAS), and life-safety markets (access control systems, real-estate mobile keys, smoke detectors, etc.).

- Execution and Innovation Leader - Developed leading-edge new customer solutions. Successfully launched 20+ significant new products/platforms per year, resulting in double-digit organic market growth.
- Held leading industry market share (90%+) in critical vertical and unique markets with technically innovative products and software.
- Division leader of GE's "Session 2" strategy creation. Key leader for multiple technical M&A (Mergers and Acquisitions) due diligence teams for numerous acquisition-targeted companies. Leader of negotiations - closed several key strategic partnerships/agreements. Yielded OM (Operating Margin) of +50% above plan.
- High-Performance - Advanced with increasing levels of responsibility; from $120M to $500M+ in revenue/year accountability. Rated as "Top-20%" talent within GE's leadership team overall. Nominated/attended executive leadership training at GE's legendary Jack Welch Executive Training Center.

GM/VP/C-LEVEL ROLES, NEW VENTURES, AND DIVESTITURES 1998-2003

VP Engineering /GM/Officer for start-ups and corporate-sponsored diversification ventures

- Ivex Corporation – Launched/pioneered/patented the first IP network video surveillance solution for the security industry. Developed an online video monitoring software service and a revolutionary IP network video appliance. Successfully acquired by a public entity. The stock price went from $3.60 to $8.60 within 30 days.
- Home Wireless Networks - Built team/leader of R&D (Research and Development) for the world's first combined voice plus data wireless home gateway. Products received "Bell" approval and were introduced under the BellSouth and MCI brands. Launched the first low-cost 802.11 access point (by Telenor in Europe). Acquired.
- Miraxis; parent company EMS TECHNOLOGIES, $309M (Acquired by Honeywell); new corporate technology diversification business based on innovative network and wireless Ka-band combined 2-way wireless WAN/Internet/video connectivity and DTH/DBS video distribution satellite technology.

SCIENTIFIC-ATLANTA ($2.5B), BROADBAND COMMUNICATIONS DIVISION 1995 – 1998

(Acquired by CISCO SYSTEMS)

Project Director, Advanced Video Systems (AVS) 1997-1998
Engineering Manager, Home Communications Terminals 1996-1997
Engineering Manager, 8600x 1995-1996

Led director-level cross-functional team developing next-generation interactive TV (iTV) 2-way video cable set-top boxes to replace $400M/year Advanced Video Systems (AVS) broadband products. Built engineering department and provided daily direction to multi-disciplined engineering department responsible for Scientific-

Atlanta's highest revenue-earning product, the 8600x cable set-top. Direct engineering management responsibility for AVS high-volume domestic set-top boxes, remote controls, and third-party partnerships.

- Engineering manager for consumer iTV video products – the company's highest revenue-earning product lines ($200M/year) with volumes over 1M+/year (8600x, 8600, etc.).
- Reversed 10-year legacy of re-branding Panasonic set-top boxes by successfully building a new engineering organization and launching the company's first internally designed high-volume, low-cost product. Volumes reached 80K/month. Reduced COGS (Cost of Goods Sold) by 40%, from $154 to $78.
- Spearheaded the launch of the company's first high-volume product to be built in a new company-owned factory in Mexico. Proactively developed processes and infrastructure.
- Led the introduction of new development processes and successfully completed business plans, product definitions, ROI (Return on Investment) analysis, forecasts, and resource plans for next-generation set-top products to replace the existing $400M/year broadband AVS products.
- Managed daily design engineering activities and contract manufacturing support with Panasonic, WKK, and other international third-party partners.

SCHLUMBERGER INDUSTRIES ($14B), EMNA **1987 – 1995**
(Acquired by ITRON)

Engineering Manager, Residential and Commercial Metering 1994-1995
Hardware Manager, Recorders, and Translation Systems 1990-1994
Senior Electronic Design Engineer 1989-1990
Electronic Design Engineer 1987-1989

Engineering manager for Schlumberger's Electricity Management, North America (EMNA) division. Managed technologists, supervisors, multi-disciplined developers, and quality assurance/software quality assurance personnel developing high-volume electronic communication products, meter reading solutions, modems, and power monitoring equipment used by the electric utility industry to monitor and control power on the power grid.

- Designed working ASIC (Application Specific Integrated Circuit) on the first pass. Granted two patents.
- Hands-on developer and primary designer for the division's top two highest-priced/most profitable products (Gross Margin: 55%, Average Sales Price: $2,000).
- Managed R&D organization for residential and commercial product lines, obtaining over $60M/year in revenue with product line volumes ranging from 10,000s/year to 100,000s/year.
- Promoted, dynamically improved, and launched the division's highest revenue product (the "Vectron") after a two-year delay within another R&D organization.
- As hardware manager, launched new product lines that spawned new services business.
- Annually selected and participated in the "Best Program" for high-potential leaders.

BABCOCK & WILCOX, NUCLEAR POWER DIVISION **1984 - 1987**
Electronic Design Engineer/Senior Electronics Design Engineer

As part of the "Special Products and Integrated Field Services" team, I was a designer and developer of electronic inspection systems and robotic repair systems for nuclear power plant components inside the nuclear containment building.

- Provided system, circuit, and software design for advanced video/CCTV, ultrasound, and other imaging solutions to inspect radioactive components inside the nuclear containment building.
- Board-level designer of electronic hardware using a multitude of CPU/MPUs, high-speed communication interfaces, control circuits, and complex test/measurement ADC circuits.
- Software programmer using high-level software programming languages and assembly code firmware for robotic/automation repair and inspection equipment.

EDUCATION

Ph.D. in Electrical and Computer Engineering, GPA: 4.0 **2022**

Oregon State University Corvallis, Oregon

Research areas and interests include communications, advanced video/multi-media technologies, video streaming technologies, video compression (encoding/decoding), optimization of video streaming content transmission, network coding, wireless communications/network transport, artificial intelligence/machine learning/reinforcement learning (including algorithms, classifiers, predicters, video analytics), security (including cryptography, encryption, data security, physical security).

Dissertation: "Machine Learning Bandwidth Optimization of Interactive Live Free-Viewpoint Multiview Video for Sporting Events," Oregon State University.

Graduated top of class (4.0 GPA)

Master of Science in Electrical and Computer Engineering, GPA: 4.0 **2017**

Oregon State University Corvallis, Oregon

Thesis: "Optimization of Interactive Live Free Viewpoint Multiview Video Streaming Bandwidth," Oregon State University.

Graduated top of class (4.0 GPA)

Bachelor of Science in Electrical Engineering, Magna cum laude **1984**

The University of Toledo Toledo, Ohio

Member Tau Beta Pi Engineering Honor Society

Executive MBA, 12 Credit Hours **Attended 2003**

Emory University, Goizueta Business School Atlanta, Georgia

The executive business program was globally ranked by Business Week and The Financial Times as being in the top 10 executive business programs.

CERTIFICATIONS, AFFILIATIONS, AND OTHER TRAINING

Proficient trained software/source code programmer using the following software languages/systems: Object Oriented, C, C++, C#, Java, JSON (JavaScript Object Notation), JavaScript, HTML (Hyper Text Markup Language), XML (eXtensible Markup Language), XAML (eXtensible Application Markup Language), YAML (YAML Ain't Markup Language (a recursive acronym)), Python, Google Go, MATLAB, SQL (Structured Query Language), MIRCL ("Multiprecision Integer and Rational Arithmetic C/C++ Library" which is a software library used for developing encryption and authentication algorithms), FORTRAN, and numerous assembly languages for both RISC (Reduced Instruction Set Computer) and CISC (Complex Instruction Set Computer) processors.

Member, IEEE (Institute of Electrical and Electronic Engineers).

Member Phi Kappa Phi Honor Society – Lifetime member

Java (Object Oriented) certified programmer.

GE "Six Sigma, Black Belt" training certified.

Additional post-graduate studies/certificates: DSP (Digital Signal Processing), computer architecture, finance, project management, and leadership.

PATENTS AND PATENT PUBLICATIONS

U.S. Patent Application Publication 2024/0260565 – Automatic Optimizing Pest Control Substance Delivery System; August 8. 2024.

U.S. Patent No. 5,701,253 - Isolated Current Shunt Transducer; December 23, 1997.

U.S. Patent No. 5,422,939 - Parallel Off-Hook Detection for Both Line Available and Phone Pick-up Detection, June 6, 1995.

ACADEMIC WORK (PUBLISHED AND NON-PUBLISHED)

1. Richard A. Kramer, Dissertation: "Machine Learning Bandwidth Optimization of Interactive Live Free-Viewpoint Multiview Video for Sporting Events," Oregon State University, May 17, 2022 (presented, June 15, 2022).

2. Richard A. Kramer, Thinh Nguyen, "Optimization of Interactive Live Free Viewpoint Multiview Video Streaming Bandwidth", Proceedings of SAI Intelligent Systems Conference, IntelliSys 2018: Intelligent Systems and Applications pp. 641-657 (presented, September 6, 2018, London, UK).

3. Richard A. Kramer, Jin Phoy Rhee, "The Need, Advances and Challenges Related to Wireless Body Area Network Communications Technology", Oregon State University, June 6, 2017 (presented, June 8, 2017).

4. Richard A. Kramer, Aashutosh Y. Taikar, Warit Paweenbampen, Haya Alorayj, Surabhi Tushar Godambe, "The Challenges and Advances in Mixed Reality Video Technology", Oregon State University, June 7, 2017 (presented, June 7, 2017).

5. Michael Foster, Richard Kramer, "A Low-Power, Low-Noise, High-Gain Differential Operational Amplifier", June 8, 2017

6. Richard A. Kramer, Thesis: "Optimization of Interactive Live Free Viewpoint Multiview Video Streaming Bandwidth", Oregon State University, April 10, 2017 (presented April 10, 2017).

7. Richard A. Kramer, Mathias Elmlinger, Abhishek Ramamurthy, Siva Pranav Kumar Timmireddy, "A Comprehensive Review of the Challenges and Opportunities Confronting Cache Memory System Performance", Oregon State University, March 13, 2017 (presented March 16, 2017).

8. Richard A. Kramer, Presentation/Lecture: "ESIGN and Other RSA Alternative Signature Schemes", Oregon State University, February 8, 2017.

9. Richard A. Kramer, ESIGN, ECDSA, ED25519 Cryptographic Signature Software Code, January 16, 2017.

10. Richard A. Kramer, "A Survey of ESIGN: State of the Art and Proof of Security" (re-issue with full implementation, performance testing, and data analysis), Oregon State University, January 16, 2017.

11. Richard A. Kramer, "The Insecurity of Libcrypts's PRG", Oregon State University, February 9, 2017.

12. Richard A. Kramer, "A Survey of ESIGN: State of the Art and Proof of Security", Oregon State University, November 7, 2016.

13. Richard A. Kramer, Presentation/Lecture: "Secure Audit Logging Systems with Privacy Preservation", Oregon State University, October 25, 2016.

14. Richard A. Kramer, "Efficient Multimedia Distribution in Source Constraint Networks", Oregon State University, November 3, 2015.

15. Richard A. Kramer, "An Analysis of Dynamic Flow Scheduling for Data Center Networks", Oregon State University, August 27, 2015.

16. Richard A. Kramer, "An analysis for the paper: Interactive Streaming of Stored Multiview Video Using Redundant Frame Structures". Oregon State University, December 22, 2015.

17. Richard A. Kramer, "An analysis for the paper: Video Streaming with Network Coding", Oregon State University, November 2, 2015.

18. Richard A. Kramer, Presentation/Lecture: "Hedera – An Analysis of Dynamic Flow Scheduling for Data Center Networks", Oregon State University, October 25, 2015.

19. Richard A. Kramer, "An Analysis of Cloud-Based Data Centers Costs", Oregon State University, August 27, 2015.